RESOLUTION AWARDING BID FOR PFLUG ROAD, 228TH ST. TO 230TH ST., PROJECT C-77 (15-14) FOR THE PUBLIC WORKS DEPARTMENT

WHEREAS, pursuant to Neb. Rev. Stat. §23-104(6), the County has the power to do all acts in relation to the concerns of the County necessary to the exercise of its corporate powers; and,

WHEREAS, pursuant to Neb. Rev. Stat. §23-103, the powers of the County as a body are exercised by the County Board; and,

WHEREAS, bids for Pflug Road, 228th St. to 230th St., Project C-77 (15-14) have been solicited, made, opened and reviewed pursuant to applicable Nebraska State Statutes; and,

WHEREAS, based on those proceedings, and after a public hearing, this Board has duly deliberated and considered the bids received; and,

WHEREAS, this Board desires to proceed forthwith in order to expedite and facilitate service to the citizens of Sarpy County.

NOW, THEREFORE, be it resolved by this Board of County Commissioners that:

1. The low bid of High Plains Enterprises for the Pflug Road, 228th St. to 230th St., Project C-77 (15-14) for Four Hundred Thirty Eight Thousand Two Hundred Sixty Two Dollars and Forty Four Cents ($438,262.44) is accepted, ratified, and confirmed.

2. This Board’s Chairman, Clerk, and Attorney are hereby authorized and directed to execute such ancillary documents as may be required to evidence the contract and take any and all steps necessary or required in order to carry out the terms of such contract after said documents have been reviewed by the Attorney, Fiscal Administrator, and County Administrator.

The above resolution was approved by a vote of the Sarpy County Board of Commissioners at a public meeting duly held in accordance with applicable law on the 23rd day of January, 2018.
MEMO

To: Sarpy County Board of Commissioners

From: Beth Garber

Re: Award Pflug Road

On December 7, 2017, eight (8) bids were opened for Pflug Road – 228th St. to 230th St., Project C-77 (15-14). After review, it is recommended the County award the bid to the low bidder, High Plains Enterprises for $438,262.44. The Public Works Department and Purchasing have extensively reviewed the bid with the project engineer and contractor along with contacting references for High Plains. High Plains is comfortable with their bid and their references were all positive.

Bids for the project ranged from $438,262.44 to $896,860.67. The second low bid was from PSC Construction for $567,509.47. The Engineer’s estimate was $885,318.50. The estimated contract period of performance is for 30 working days. Working days is defined as when the temperature is above 40 degrees and rising and which are suitable for the construction of this project, except Sundays and holidays.

Please contact me with any questions at bgarber@sarpy.com.

January 19, 2018

Beth Garber

cc: Dan Hoins
Scott Bovick
Brian Hanson
Deb Houghtaling
Denny Wilson
1. Mobilization: 1.00 LS, $19,000.00, $3,000.00, $3,000.00, $31,600.00, $55,000.00, $55,000.00.
2. General Clearing and Grubbing: 1.00 LS, $9,000.00, $2,000.00, $2,000.00, $6,000.00, $15,000.00, $15,000.00.
3. Construction Staking and Surveying: 1.00 LS, $5,050.00, $2,500.00, $2,500.00, $5,000.00, $5,000.00, $5,000.00.
4. Traffic Control: 1.00 LS, $2,610.00, $3,500.00, $3,500.00, $2,500.00, $2,500.00, $2,200.00.
5. Excavation (Established Quantity): 17,744.00 CY, $9.70, $172,116.80, $5.11, $90,671.84, $6.00, $106,464.00, $5.40, $95,817.60.
6. Earthwork Measured in Embankment: 15,876.00 CY, $14.40, $228,614.40, $7.60, $120,657.60, $10.00, $158,760.00, $10.90, $173,048.40.
7. Water: 240.00 MGAL, $1.00, $240.00, $25.00, $6,000.00, $30.00, $7,200.00, $7.50, $1,800.00.
8. Drainage Blanket: 3,840.00 SY, $26.00, $99,840.00, $1.80, $6,912.00, $35.00, $134,400.00, $24.00, $92,160.00.
9. Riprap Filter Fabric: 1,428.00 SY, $3.00, $4,284.00, $3.00, $4,284.00, $3.00, $4,284.00, $2.00, $2,856.00.
10. Rock Riprap, Type C: 1,619.00 TON, $60.00, $97,140.00, $44.00, $71,236.00, $2,500.00, $97,140.00, $72.00, $116,568.00.
11. Class 47B-3000 Concrete for Inlet and Junction Box: 1.80 CY, $2,120.00, $3,816.00, $1,300.00, $2,340.00, $1,500.00, $2,700.00, $1,800.00, $3,240.00.
12. Reinforcing Steel for Inlet and Junction Box: 127.00 LB, $4.00, $508.00, $5.00, $635.00, $5.00, $635.00, $2.10, $266.70.
13. 24" Culvert Pipe, Type 5: 488.00 LF, $137.00, $109,800.00, $92.00, $828.00, $100.00, $97,140.00, $120.00, $112,240.00.
14. 72" Culvert Pipe, Type 5: 9.00 EACH, $1,730.00, $6,920.00, $1,448.00, $5,792.00, $2,000.00, $8,000.00, $3,500.00, $14,000.00.
15. Remove Culvert Pipe: 152.00 LF, $53.00, $8,056.00, $15.00, $2,280.00, $20.00, $3,040.00, $3.00, $4,560.00.
16. Remove & Salvage Guardrail: 202.00 LF, $3.00, $606.00, $3.00, $606.00, $6.00, $1,212.00, $12.00, $2,424.00.
17. Object Marker (Type 2): 1.00 EACH, $235.00, $235.00, $500.00, $500.00, $200.00, $200.00, $172.00, $172.00.
18. Rental of Motor Grader, Fully Operated: 24.00 HOUR, $90.00, $2,160.00, $120.00, $2,880.00, $175.00, $4,200.00, $120.00, $2,880.00.
19. Rental of Dump Truck, Fully Operated: 24.00 HOUR, $80.00, $1,920.00, $80.00, $1,920.00, $85.00, $2,040.00, $100.00, $2,400.00.
20. Rental of Skid Loader, Fully Operated: 24.00 HOUR, $65.00, $1,560.00, $80.00, $1,920.00, $85.00, $2,040.00, $125.00, $3,000.00.
21. Crushed Rock for Base Course: 70.00 TON, $35.00, $2,450.00, $38.00, $2,660.00, $30.00, $2,100.00, $30.00, $2,100.00.
22. Crushed Rock Surface Course: 70.00 TON, $29.50, $2,065.00, $39.00, $2,730.00, $30.00, $2,100.00, $30.00, $2,100.00.
23. Seeding, Type A: 1.60 ACRE, $1,295.00, $2,072.00, $1,600.00, $2,560.00, $1,320.00, $2,112.00, $2,060.00, $3,296.00.
24. Mulch: 4.00 TON, $677.00, $2,708.00, $300.00, $1,200.00, $330.00, $1,320.00, $220.00, $880.00.
25. Rock Riprap, Type C: 3,990.00 SY, $1.20, $4,680.00, $2.00, $6,780.00, $1.76, $4,271.40, $1.25, $4,237.50.
26. Erosion Control, Class 1D: 147.00 SY, $2.00, $294.00, $2.00, $294.00, $3.00, $414.00, $3.00, $484.00.
27. Silt Check, Type II, High: 1,040.00 LF, $4.90, $5,096.00, $5.00, $5,200.00, $4.81, $5,062.40, $4.00, $16,160.00.

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**GRAND TOTAL:**
- M.E. Collins Contracting Co. Inc.: $793,476.90
- High Plains Enterprises: $693,135.38
- Sean Negus Construction: $723,175.20
- Chas. Vrana & Son Construction: $723,175.20

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**P:\Highway Construction Projects\Pflug Road 228th St - 230th St. 15-14\Bid Tab 15-14.xlsx**
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<th>Description</th>
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<td>Crushed Rock for Base Course</td>
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**P:\Highway Construction Projects\Pflug Road 228th St. - 230th St. 15-14\Bid Tab 15-14.xlsx**

**Bid Opening:**
10:00 a.m., Thursday December 7, 2017
MEMORANDUM

To: Sarpy County Board of Commissioners
From: Dennis L. Wilson, P.E., Ph.D., Sarpy County Engineer
Subject: C-77(15-14) – Pflug Road – 228th to 230th Street
Date: January 18, 2018

On December 12, 2017, eight (8) bids were opened publically in the County Boardroom. The lowest bid was from High Plains Enterprises from Martell, Nebraska with a total bid of $438,262.44, which is 49.5% of the Engineer's estimate of $885,318.50. The Second low bid was from PSC Construction of Blair, Nebraska with a total bid of $567,509.47.

Public Works and Purchasing conducted informal phone interviews with the two lowest apparent bidders, as well as checked references as listed in the bid proposals. After asking a few follow up questions specifically in regards to the Drainage Blanket items, all outstanding questions were answered by both bidders. Public Works anticipates entering into an agreement with WSP, the Engineer of Record, to provide construction phase services on behalf of the County, as to ensure project concurrence.

After thorough consideration, Public Works recommends the bid be awarded to High Plains Enterprises in the amount of $438,262.44. Feel free to contact me if you have any questions.
CONTRACT AGREEMENT

THIS CONTRACT is made and entered into by and between Sarpy County, Nebraska hereinafter called County, and High Plains Enterprises hereinafter called Contractor.

In consideration of the following mutual agreements and covenants, it is understood and agreed by the parties hereto that:

1. **The Contractor does hereby agree to undertake and construct Sarpy County Project C‐77 (15‐14), Pflug Road, 228th Street to 230th Street, Culvert Replacement**
   Also referred to hereinafter as work, in accordance with terms and provisions hereof and subject to the quality provisions in the accepted Proposal of Contractor for the sum of Four Hundred Thirty Eight Thousand Two Hundred Sixty Two Dollars and Forty Four Cents ($438,262.44) under penalty of Performance, Payment and Guarantee Bond.

2. The Contractor shall conform with the applicable plans and specifications, applicable Special Provisions and any applicable change order or addenda pertaining thereto or to this Contract, all of which by reference thereto are made a part hereof. Applicable notice to bidders, Instruction to bidders, Bid Proposal of Contractor, Resolution awarding this Contract, the Performance, Payment and Guarantee Bond and all proceedings by the governing body of the County relating to the aforesaid work are made a part hereto by reference thereto.

3. The County agrees to pay the Contractor in accordance with the provisions of the specifications, the accepted Proposal of the Contractor and the provisions of this Contract.

4. All provisions of each document and item referred to in Paragraph 2 above shall be strictly complied with the same as if rewritten herein, and in the event of conflict among the provisions of said documents, the provisions most favorable to the County shall govern, and substitution or change shall be made except upon written direction, the form of which shall be written “Change Order” of the County; and substitution or change shall in no manner be construed to release either party from any specified or implied obligation of this Contract except as specifically provided for in the Change Order.

5. The Contractor warrants that it has neither employed nor retained any company or person, other than bona fide employee working for Contractor to solicit or secure this Contract, and that Contractor has not paid or agreed to pay any company or person, other than a bona fide employee, any fee, commission percentage, brokerage fee, gift or any other consideration, contingent upon or resulting from the award or making of this Contract. For breach or violation of this warranty, County shall have the right to annul this Contract without liability, or in its discretion, to deduct from the Contract price or consideration, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

and Contractor declare, promise, and warrant that they have and will continue to comply fully with the Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C.A. 1985, et seq.); and the Nebraska Fair Employment Practice Act, Neb. Rev. Stat. 48-1101, et seq., (Reissue 1993), in that there shall be no discrimination against any person who is employed in the performance of this Contract, or against any applicant for such employment, because of age, color, national origin, race, religion, creed, disability or sex.

7. The Contractor shall indemnify and save harmless Sarpy County, its officers, employees, agents and representatives from all claims, suits or actions of every kind and character made upon or brought against the said Sarpy County, its officers, employees, agents and representatives for on or account of any injuries or damages received or sustained by any party or parties by or from the acts or omissions of the said Contractor or its servants, agents, representatives and subcontractors, in doing the work herein contracted for or by or in consequence of any negligence in guarding the same or any improper material used in its construction or by or on account of any act or omission of said Contractor or its servants, agents, representatives and subcontractors arising out of any manner connected with the performance of this Contract, and also from all claims or damage for infringement of any patent in fulfilling this Contract.

8. The Contractor agrees to comply with the residency verification requirements of Neb. Rev. Stat. §4-108 through §4-114. The Contractor is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of a newly hired employee.

If the Contractor is an individual or sole proprietorship, the following applies:

1. The Contractor must complete the United States Citizenship Attestation Form, available on the Department of Administrative Services website at www.das.state.ne.us.

2. If the Contractor indicates on such attestation form that he or she is a qualified alien, the Contractor agrees to provide the U.S. Citizenship and Immigration Services documentation required to verify the Contractor's lawful presence in the United States using the Systematic Alien Verification for Entitlements (SAVE) Program.

3. The Contractor understands and agrees that lawful presence in the United States is required and the Contractor may be disqualified or the contract terminated if such lawful presence cannot be verified as required by Neb. Rev. Stat. Sect. 4-108.

9. **Insurance Requirements**

The Contractor shall not begin work under this Agreement until all insurance certificates have been filed with the Sarpy County Clerk.
The following insurance coverages shall be kept in force during the life of the Agreement and shall be primary with respect to any insurance or self-insurance programs covering the County, its commissioners/supervisors, officials, agents, representatives and employees. These insurance coverages shall specifically state, or be endorsed to state, that thirty (30) days notice shall be given to the County in the event of cancellation of, or material change in, any of the coverages.

a. **Worker’s Compensation and Employers Liability Insurance**

   The minimal acceptable limits shall be the statutory limits as required by the State of Nebraska for Coverage A, Workers’ Compensation and $500,000 each accident for Coverage B, Employers Liability.

b. **Commercial General Liability Insurance**

   Coverage should include broad form coverage written on a commercial general liability form and written on an occurrence basis. The coverage must protect against claims for damages resulting from bodily injury, including death, personal injury and property damage.

   The minimum acceptable limits of liability shall be $1,000,000 each occurrence. If the coverage contains a general aggregate, such limit shall not be less than $2,000,000. The products/completed operations limit shall not be less than $2,000,000. The County shall be named as an additional insured on the insurance coverage required under this section.

c. **Automobile Liability Insurance**

   Coverage shall be against claims for damages resulting from bodily injury, including death and property damage, which may arise from the operations of any owned, hired or non-owned automobile. The minimum acceptable limit of liability shall be $1,000,000 Combined Single Limit for each accident. The County is to be named as an additional insured on the insurance coverage required under this section.

d. **Certificate of Insurance**

   The Contractor shall furnish the County with a certificate(s) of insurance evidencing the coverage required in this section. If the certificate(s) is shown to expire prior to completion of all the terms of this Agreement, the Contractor shall furnish a certificate(s) of insurance evidencing renewal of its coverage to the County. The County is to be included as an additional insured on the insurance coverage required under this section.

   The Contractor shall require each and every Subcontractor performing work under this Agreement to maintain the same coverages required of the Contractor in this Section, and upon the request of the County, shall furnish the County with a certificate(s) of insurance evidencing the Subcontractor’s insurance coverages required in this section.
f. **Insurance Company**

All insurance coverages herein required of the Contractor shall be written by an insurance company or companies transacting business as an admitted insurer in the State of Nebraska or under the Nebraska Surplus Lines Insurance Act. All insurance companies must possess a minimum A.M. Best Insurance Company rating of A-. Upon request by the County, the Contractor shall furnish evidence that the insurance company or companies being used by the Contractor meet the minimum requirements listed in this section.

Upon request by the County, the Contractor shall furnish the County with complete and accurate copies of the insurance policies required within this section. If at any time during the life of this Contract, the Contractor’s insurance coverages and limits do not meet or exceed the minimum insurance requirements presented in this section, the Contractor is required to notify the County of any deviations from the minimum requirements presented in this section.

10. The Contractor shall pay to the Unemployment Compensation Fund of the State of Nebraska unemployment contributions and interest due under the laws of the State of Nebraska on wages paid to individuals employed in the performance of this Contract, and shall submit to Sarpy County written clearance from the Commissioner of Labor of the State of Nebraska certifying that all payments due of contributions and interest which may have arisen under this Contract have been paid by the Contractor or his subcontractor, to the State of Nebraska Unemployment Compensation Fund. Payment of the final five percent (5%) of the total amount of the Contract shall be withheld until this provision have been complied with as required by Section 48-657 R.R.S. 1943, as amended.

11. The Contractor shall not, in performance of this Agreement, discriminate or permit discrimination against any person because of race, sex, age or political or religious options or affiliations in violation of federal or state laws or local ordinances and further the Contractor shall comply with Sarpy County ordinances pertaining to civil rights and human relations.

12. The Contractor shall procure a policy or policies of insurance which shall guarantee payment of compensation according to the Workmen’s Compensation Laws of Nebraska for all workmen injured in the scope of employment; and further agrees to keep said policy or policies in full force by the Contractor throughout the term of this Contract. Certificates of insurance or copies of policies if required by any department of the County, shall be filed by the Contractor with Sarpy County.

13. Except as may otherwise be required by applicable law payment of any balance due to the Contractor under this Contract shall be made by the County to the Contractor upon completion of the Contractor’s work and obligations in accordance with the Contract, upon acceptance thereof by the County, and upon submission of certificate by the Contractor in accordance to above. No payment by the County shall in any way constitute any waiver of any rights of Sarpy
14. Pursuant to Neb. Rev. Stat. 23-3113, the Parties hereto declare and affirm that no officer, member, or other employee of the County, and no member of its governing body, and no other public official of the County who exercises any functions or responsibilities in the review or approval of the undertaking described in this Contract, or the performing of services pursuant to this Contract shall participate in any decision relating to this contract which effects his or her personal interest, or any corporation, partnership, or association in which he or she is directly or indirectly interested; nor shall any employee of the County, nor any member of its governing body, have any interest, direct or indirect, in this Contract or the proceeds thereof.

15. Neither County nor Contractor shall engage the services of any person or persons presently in the employ of the other for work covered by this Contract without the express written consent of the employer of such person or persons.

16. Each party declares, represents, warrants and acknowledges that it is not an agent for the other now, nor will it be in the future. Each party is an independent Contractor, and neither party is or will become the employee of the other as a result of the relationship created by this Contract.

17. It is understood and agreed by the parties hereto that is any part, term, condition or provision of this Contract is held to be illegal or in conflict with any law of this State or of the United States, the validity of the remaining parts, terms, conditions, or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Contract did not contain the particular part, term, condition, or provisions held to be invalid.

18. This Contract and documents incorporated herein by reference contain the entire Contract between the Parties, and there are no other written or oral promises, agreement or warrants which may affect it.

19. The Contractor acknowledges that it is, and will, remain fully obligated under the provisions of this Contract, regardless of any delegation of duties or assignment or benefits hereunder. Contractor further acknowledges and promises that the provisions of this Contract shall be made binding on any Subcontractor(s) it may retain. Contractor shall require that all Subcontractors hold County harmless from any and all claims and causes of action resulting from actions or activities of Subcontractor. Contractor shall require that all Subcontractors comply with any and all applicable State and Federal laws and that Subcontractor(s) obtain any and all necessary permits or licenses necessary to conduct work under this Contract.

20. Contractor may not subcontract or assign any portion of Contract without prior written approval from the County.

21. Contractor expressly guarantees all work and materials as described herein.
This Contract cannot be amended except by written agreement of both parties. Notice to the Parties shall be given in writing to the agents of each party named below:

**County:** Ms. Deb Houghtaling
Sarpy County Board Business Office
1210 Golden Gate Dr., Suite 1250
Papillion, NE 68046

**Contractor:** High Plains Enterprises
7200 W. Martell Road
Martell, NE 68001
(402) 421-6316 P
(402) 421-1586 F

IN WITNESS WHEREOF, the parties hereto have caused these instruments to be executed in THREE original counterparts, this as of the 19th day of July, 2018.

County of Sarpy, Nebraska
A Body Politic and Corporate

CHAIRMAN: [Signature]
07/23/2018

CONTRACTOR: [Signature]

SECRETARY/WITNESS:

[Signature]

APPROVED AS TO FORM:

[Signature]
COUNTY ATTORNEY/DUchter

ATTEST:

[Signature]
ENCLOSED: SEALED BID -
PFLUG ROAD C-77 (15-14)
CULVERT REPLACEMENT

BID OPENING DECEMBER 14TH 10:00 A.M.

HIGH PLAINS ENTERPRISES  2200 W. MARTELL ROAD  MARTELL, NE 6840
ENCLOSED:  BID BOND

PFUNG ROAD C-77 (15-14)
CULVERT REPLACEMENT

BID OPENING DECEMBER 14TH @ 10:00 A.M.

HIGH PLAINS ENTERPRISES  2200 W. MARTELL ROAD  MARTELL, NE  6840
BID BOND

Conforms with The American Institute of Architects, A.I.A. Document No. A-310

KNOW ALL BY THESE PRESENTS, That we, High Plains Diversified Enterprises, Inc., P.O. Box 96, Martell, NE 68404

as Principal, hereinafter called the Principal,

and the North American Specialty Insurance Company

of 5200 Metcalf OPN111, Overland Park, KS 66202, a corporation duly organized under the laws of the State of New Hampshire, as Surety, hereinafter called the Surety, are held and firmly bound unto Sarpy County Treasurer as Obligee, hereinafter called the Obligee,

in the sum of FIVE PERCENT OF AMOUNT BID

Dollars ($ 5% ), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Pflug Road 228th Street - 230th Street Drainage Culvert Replacement

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this 14th day of December 2017

High Plains Diversified Enterprises, Inc. (Seal)
Principal

Mark Smith, President
Title

Witness

North American Specialty Insurance Company

By Sharon K. Murray, Attorney-in-Fact

Sharon K. Murray, Attorney-in-Fact
NAS SURETY GROUP

NORTH AMERICAN SPECIALTY INSURANCE COMPANY
WASHINGTON INTERNATIONAL INSURANCE COMPANY
WESTPORT INSURANCE CORPORATION

GENERAL POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, THAT North American Specialty Insurance Company, a corporation duly organized and existing under laws of the State of New Hampshire, and having its principal office in the City of Manchester, New Hampshire and Washington International Insurance Company a corporation organized and existing under the laws of the State of New Hampshire and having its principal office in the City of Schaumburg, Illinois, and Westport Insurance Corporation, organized under the laws of the State of Missouri, and having its principal office in the City of Overland Park, Kansas each does hereby make, constitute and appoint:

DAVID A. DOMINIANI, JOAN LEU, MAURA P. KELLY, SHARON K. MURRAY and JACQUELINE L. DREY

JOINTLY OR SEVERALLY

Its true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver, for and on its behalf and as its act and deed, bonds or other writings obligatory in the nature of a bond on behalf of each of said Companies, as surety, on contracts of suretyship as are or may be required or permitted by law, regulation, contract or otherwise, provided that no bond or undertaking or contract or suretyship executed under this authority shall exceed the amount of:

ONE HUNDRED TWENTY FIVE MILLION ($125,000,000.00) DOLLARS

This Power of Attorney is granted and is signed by facsimile under and by the authority of the following Resolutions adopted by the Boards of Directors of North American Specialty Insurance Company and Washington International Insurance Company at meetings duly called and held on March 24, 2000 and Westport Insurance Corporation by written consent of its Executive Committee dated July 18, 2011.

"RESOLVED, that any two of the President, any Senior Vice President, any Vice President, any Assistant Vice President, the Secretary or any Assistant Secretary be, and each or any of them hereby is authorized to execute a Power of Attorney qualifying the attorney named in the given Power of Attorney to execute on behalf of the Company bonds, undertakings and all contracts of surety, and that each or any of them hereby is authorized to attest to the execution of any such Power of Attorney and to attach therein the seal of the Company; and it is

FURTHER RESOLVED, that the signature of such officers and the seal of the Company may be affixed to any such Power of Attorney or to any certificate relating thereto by facsimile, and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be binding upon the Company when so affixed and in the future with regard to any bond, undertaking or contract of surety to which it is attached."

By

[Seals]

By

[Seals]

IN WITNESS WHEREOF, North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation have caused their official seals to be hereunto affixed, and these presents to be signed by their authorized officers this this 7th day of April 2017.

North American Specialty Insurance Company
Washington International Insurance Company
Westport Insurance Corporation

State of Illinois ss:
County of Cook

On this 7th day of April 2017, before me, a Notary Public personally appeared ___________ Steven P. Anderson, Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation and ___________ Michael A. Ito, Senior Vice President of Washington International Insurance Company and Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation, personally known to me, who being by me duly sworn, acknowledged that they signed the above Power of Attorney as officers of and acknowledged said instrument to be the voluntary act and deed of their respective companies.

[Seal]

M. Kenny, Notary Public

I, Jeffrey Goldberg, the duly elected Vice President and Assistant Secretary of North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney given by said North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation which is still in full force and effect.

IN WITNESS WHEREOF, I have set my hand and affixed the seals of the Companies this 14th day of December 2017.

Jeffrey Goldberg, Vice President & Assistant Secretary of Washington International Insurance Company & North American Specialty Insurance Company & Vice President & Assistant Secretary of Westport Insurance Corporation
CONTRACTOR:  High Plains Enterprises

Sarpy County, Nebraska
Bid Form
Pflug Road - 228th Street to 230th Street
Culvert Replacement
Project C-77 (15-14)

The undersigned, having carefully examined the Plans and Specifications, and having examined the project areas, hereby submit our proposal.

Attached hereto is a Bid Bond in the amount of 5% of the amount bid made payable to the Sarpy County Treasurer, which is agreed shall be forfeited should the undersigned fail to perform or fail to furnish bond and securities in accordance with the proposal.

For furnishing all materials, labor, equipment, tools, together with appurtenances and accessories required to prepare, construct, erect and install the proposed improvements, complete and ready for operation, our bid as follows:

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<tr>
<th>#</th>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>UNIT PRICE</th>
<th>EXTENDED PRICE</th>
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<td>Rock Riprap, Type C</td>
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<td>Crushed Rock Surface Course</td>
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GRAND TOTAL $438,262.44

*Prices are to be F.O.B. - Sarpy County, Nebraska*

**CONTRACTOR START DATE:** January 8, 2018

If notified of acceptance of this proposal and Contract award within sixty (60) days after date stated for receipt of bids, the undersigned agrees to execute a Contract, provide insurance certificates and performance bonds for the above named work and the above stated consideration in the form required within ten (10) days of such proposal acceptance notification; to commence the work within five (5) days of the Contractor's Notice to Proceed. **Substantial Completion shall occur within thirty (30) working days of the commencement of work as described above to avoid accrual of liquidated damages. Final Completion shall be within thirty (30) calendar days of Substantial Completion.**

Total bid shall be the basis for establishing the amount of the Performance Bond in this Contract. The Total Bid is based on the quantities shown in the Proposal Form and on the dimensions shown in the Plans where specific quantities are not itemized, and is subject to additions or reductions according to the actual construction quantities as determined by the Engineer. Any such change orders shall be made by and become a part of the Engineers Certified Progress Statement(s) of work in progress as well as final completed construction (Project Completion Report(s)).

The undersigned has carefully checked the bid blank quantities against the Plans and Specifications before preparing this Proposal and accepts the said quantities and amounts, as correctly listing the
contractor: high plains enterprises

complete work to be done in accordance with the plans and specifications.

the county board reserves the right to waive informalities and irregularities and to award bids which furnish the material and construction that, in their opinion, will serve in the best interest of the county or to reject any/or all bids.

the undersigned also agrees that the time of commencement, rate of progress and time of completion of the work of the contract are essential conditions of the contract and that the county may retain a sum of one five hundred ($500.00) per calendar day from the sum due under the contract for each calendar day that the contract is not completed as described above.

company information:

years in business: 7 years

# of employees: 34

total sales last 3 years:

7.5 million 2017
3 million 2016
2.5 million 2015

references:

company name: lundquist construction
address: 2516 deer park blvd. omaha, ne
contact name: jesse ridder phone number: (402) 342-1607
fax number: date of purchase: feb 2017

company name: mazzetti bros
address: 3441 pioneers blvd lincoln, ne
contact name: phone number: (402) 483-2902
fax number: date of purchase: dec 2016

company name: smock construction
address: 800 lakeview blvd. north platte, ne
contact name: dale buckhard phone number: (308) 532-8600
fax number: date of purchase: march 2012

i certify that this bid is submitted in accordance with the specifications issued by sarpy county. i affirm that the original specifications have not been altered in any way. any alteration of the original specifications, outside of an alternate bid, may be considered grounds for refusal of the bid.

the undersigned acknowledged receipt of the following addenda (if applicable):
CONTRACTOR: High Plains Enterprises

Addendum #1 12/4/17
Addendum #2 12/8/17

High Plains Enterprises

Company Name

Kevin Mack

Company Representative (Please print)

9200 W. Martell Road

Authorized Signature

Telephone Number

Address

(402) 421-0316

Fax Number

Martell, NE 68404

(402) 421-1386

City, State & Zip

Kevin Mkehighplainsnebraska.com

E-Mail Address

*NOTE: Sarpy County is tax exempt and will provide the proper form upon request
SPECIFICATIONS
Pflug Road,
228th Street to 230th Street
Drainage Culvert Replacement

Project C-77 (15-14)

For the

Public Works Department
SARPY COUNTY, NEBRASKA

PROPOSALS DUE:
10:00 a.m. Thursday, December 07, 2017
General Information

Notice to Contractors

Sarpy County is seeking proposals for culvert replacement for Pflug Road from 228th Street to 230th Street for the Sarpy County Public Works Department. The successful Contractor will enter into a Contract (see attached Exhibit "A") for the specified services.

Sealed bids will be received Monday through Friday 8:00 a.m. to 4:45 p.m. except holidays, until 10:00 a.m. Thursday, December 7, 2017. Bids shall be in a sealed envelope, clearly marked “Sealed Bid –Pflug Road, C-77(15-14) and shall have the names of the Contractor, and the time and date of the bid opening. **Do not fax bids, only sealed bids will be accepted.**

Bidders may obtain bidding documents at the Sarpy County Purchasing Department by emailing Beth Garber at bgarber@sarpy.com.

Contractors that obtain specifications from the internet sites are responsible for obtaining any addenda that may be added at a later time.

Bids must be sent to:

Deb Houghtaling  
Sarpy County Clerk's Office  
1210 Golden Gate Drive, Suite 1250  
Papillion, NE 68046

Bids not addressed and delivered to the above person will not be considered. Bids received after the above stated time and date will not be considered.

Bid opening will be a public opening to be held in the Sarpy County Board Room at 1210 Golden Gate Drive, Papillion, NE. The bid opening will be at 10:00 a.m. Thursday, December 07, 2017.

All bids submitted shall be valid for a period of sixty (60) days following the final date for submission of bids.

Sarpy County will not be liable for costs incurred by Contractors for proposal preparation, printing, or demonstration. All such costs shall be the responsibility of the Contractor.

The bids shall include all charges and applicable taxes, F.O.B., various locations, Sarpy County, Nebraska. The Contractor need not include sales tax in the bid. Sarpy County will, upon request, furnish the successful Contractor with a completed State of Nebraska Tax Exempt Form 13 upon acceptance of the successful Contractor's proposal.

The Sarpy County Board of Commissioners reserves the right to reject any or all bids and to waive minor informalities.

In the event of conflict between unit price and extended price, unit price shall prevail.
Procedures for Evaluation and Awarding of Bid:

1. Evaluation will be done by Beth Garber, Sarpy County Purchaser and personnel from the Sarpy County Public Works Department. After evaluation the Purchaser will make a recommendation to the County Board of Commissioners for award. This recommendation and pending award will be made at a public meeting of the Board of Commissioners. Agendas are available each Friday afternoon on our internet site www.sarpy.com. The Commissioners award the bid by majority vote.

2. The following factors will be used to consider the award of the bid, where applicable:
   a. Compliance with all requirements.
   b. Price.
   c. The ability, capability, and skills of the Contractor to perform.
   d. The character, integrity, reputation, judgment, experience, and efficiency of the Contractor.
   e. The quality of previous performance.
   f. Whether the Contractor can perform within the time specified.
   g. The previous and existing compliance of the supplier with laws.
   h. The life-cost of the personal property or services in relation to the purchase price and specified use.
   i. The performance of the personal property or service taking into consideration any commonly accepted tests and standards of product, service, usability and user requirements.
   j. The energy efficiency ratio as stated by the supplier.
   k. The life-cycle costs between alternatives for all classes of equipment, the evidence of expected life, the repair and maintenance costs, and the energy consumption on a per year basis.
   l. Such other information as may be secured having a bearing on the decision.

Terms and Conditions:

1. **Bid Bond**
   Each bid must be accompanied in a SEPARATE SEALED ENVELOPE by a cashier's check on a bank whose deposits are insured by the Federal Deposit Insurance Corporation or a bid bond in the amount of five percent (5%) of the bid price and must be payable without condition to the Sarpy County Treasurer, to protect Sarpy County against failure to perform as bid. The selected Contractor's security will be retained until satisfactory delivery of performance bond and all Contract documents are signed and received. All other Contractor's security will be retained for 30 days after bid award. If cashier's check or bid bond as herein set forth is not received with the proposal, the proposal may not be considered.

2. **Performance Bond**
   The successful Contractor shall be required to furnish a performance bond, said bond shall be in the amount of 100% of the total amount of the bid, written by a Surety licensed to do business in the State of Nebraska. Said performance bond shall be provided to the Sarpy County Clerk ten
(10) days after execution of Contract documents and bid award. Bond may be secured through the Contractor’s usual sources.

3. **Information, Discussion, and Disclosures**

   a. Any information provided by Sarpy County to any Contractor prior to the release of this Request for Proposal (RFP), verbally or in writing, is considered preliminary and is not binding on Sarpy County.

   a. The Contractor must not make available nor discuss any cost information contained in the sealed copy of the proposal to or with any employee of Sarpy County from the date of issuance of this RFP until the Contract award has been announced, unless allowed by the Sarpy County Purchasing Department in writing for the purpose of clarification or evaluation.

   c. No interpretation of the meaning of the specifications, or other bidding documents, nor correction of any ambiguity, inconsistency, or error therein will be made orally to any Contractor.

   d. Every request for such interpretation or correction should be in writing, addressed to the Sarpy County Purchaser, Beth Garber, 1210 Golden Gate Drive, Papillion, NE 68048 or bgarber@sarpy.com. **Requests must be received by 12:00 p.m., Friday, December 01, 2017 in order for Sarpy County to have time to issue an addendum.** Requests received after the deadline may not be considered. In case Sarpy County finds it expedient to supplement, modify, or interpret any portion of the bidding documents prior to the proposed bid date, such procedure will be accomplished by the issuance of written addenda to the RFP which will be mailed or delivered to all prospective Contractors at the respective addresses furnished for such purpose.

4. **Confidentiality of Documents**

   Sarpy County considers all information, documentation and other materials requested to be submitted in response to this proposal to be of a non-confidential and/or non-proprietary nature and therefore shall be subject to public disclosure under Neb. Rev. Stat. § 84-712.05(3).

   Contractors are hereby notified that Sarpy County strictly adheres to all statutes, court decisions, and opinions of the Nebraska Attorney General with respect to disclosure of RFP information.

   Any “proprietary, trade secret, or confidential commercial or financial” information must be clearly identified, in a separate sealed envelope, at the time of bid/proposal submission. **Pricing information is not considered financial information and therefore is not considered confidential.** Please note: even if Contractor believes pricing information is confidential and includes it in a separate, sealed envelope, such information will be read aloud and entered into record during the public bid opening. For all other appropriately identified proprietary, trade secrets, or confidential commercial or financial information, the Contractor will be required to fully defend, in all forums, Sarpy County’s refusal to produce such information; otherwise, Sarpy County will make such information public upon request.
5. Addenda
   a. All addenda will become part of this RFP and be responded to by each Contractor.
   b. All addenda must be acknowledged in writing in the bid submitted by the Contractor.
   c. This RFP, any subsequent addenda, and any written responses to questions take precedence over any information previously provided.

6. Non-Discrimination Clause
   Pursuant to Neb. Rev. Stat. §73-102 (Reissue 1996), Contractor declares, promises, and warrants it has and will continue to comply fully with Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C.A. §1985, et seq.), and the Nebraska Fair Employment Practice Act, Neb. Rev. Stat. §48-1101, et seq. (Reissue 2004), in that there shall be no discrimination against any employee who is employed in the performance of this Contract, or against any applicant for such employment, because of age, color, national origin, race, religion, creed, disability or sex.

7. Conflict of Interest Clause
   Pursuant to Neb Rev. Stat. §23-3113 (Reissue 1997), the parties hereto declare and affirm that no officer, member, or employee of the County, and no member of its governing body, and no other public official of the County who exercises any functions or responsibilities in the review or approval of the undertaking described in this Contract, or the performing of services pursuant to this Contract, shall participate in any decision relating to this Contract which affects his or her personal interest, or any corporation, partnership, or association in which he or she is directly or indirectly interested; nor shall any employee of the County, nor any member of its governing body, have any interest, direct or indirect, in this Contract or the proceeds thereof.

8. Payment Terms
   The successful Contractor shall submit an itemized invoice for payment. Sarpy County will make payment to the successful Contractor within thirty (30) days after receipt of invoice and satisfactory services in accordance with the Contract and Special Provisions.

9. Supplemental Terms and Conditions/Modifications
   Any supplemental terms, conditions, modifications, or waiver of these terms and conditions must be in writing and signed by the Sarpy County Board Chairman and the Contractor.

10. Termination
    Either party may terminate the Contract with ninety (90) days written notice to the other.

11. Breach
    Should Contractor breach, violate, or abrogate any term, condition, clause or provision of this agreement, the County shall notify Contractor in writing that such an action has occurred. If
satisfactory provision does not occur within ten (10) days from such written notice, the County may, at its option, terminate this agreement and obtain an alternate provider to provide all required materials. This provision shall not preclude the pursuit of other remedies for breach of Contract as allowed by law.

12. **Assignment**

The Contractor may not assign this agreement without the prior written consent of the County.

13. **Subcontracting**

Contractor may not subcontract the work to be performed, without prior written consent of the County. If such consent is granted, Contractor will retain responsibility for all work associated with the Contract. The Contractor must identify any subcontractors they intend to use in the execution of this Contract.

14. **Independent Contractor**

The Contractor shall in the performance of the Contract at all times be an independent contractor and not an employee or agent of the County. The Contractor, its officers, employees and agents shall at no time represent the Contractor to be other than an independent contractor or represent themselves to be other than employees of the Contractor.

15. **Indemnity**

The Contractor shall indemnify and save harmless Sarpy County, its officers, employees and agents from all loss, claims, suits or actions of every kind and character made upon or brought against Sarpy County, its officers, employees, agents, for or sustained by any party or parties as a result of any act, error, omission or negligence of said Contractor or its servants, agents, and subcontractors; and also from all claims of damage in fulfilling this Contract.

16. **Residency Verification**

The Contractor agrees to comply with the residency verification requirements of Neb. Rev. Stat. §4-108 through §4-114. The Contractor is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of a newly hired employee.

If the Contractor is an individual or sole proprietorship, the following applies:

1. The Contractor must complete the United States Citizenship Attestation Form, available on the Department of Administrative Services website at www.das.state.ne.us.
2. If the Contractor indicates on such attestation form that he or she is a qualified alien, the Contractor agrees to provide the U.S. Citizenship and Immigration Services documentation required to verify the Contractor's lawful presence in the United States using the Systematic Alien Verification for Entitlements (SAVE) Program.

3. The Contractor understands and agrees that lawful presence in the United States is required and the Contractor may be disqualified or the contract terminated if such lawful presence cannot be verified as required by Neb. Rev. Stat. Sect. 4-108.

17. **Insurance**

   The Contractor shall comply with the indemnification and save harmless provisions of the Contract.

18. **Guarantee**

   a. **Terms:**

      The Contractor hereby expressly guarantees the work and materials described herein for the full period of **two (2) years** from the date of approval and acceptance by the County, and said Contractor binds itself and heirs and assigns for the entire expense of maintaining same in good condition (except normal wear and tear not occasioned by improper methods/materials); and for all repairs or reconstruction which may, from any imperfection in the said work or materials become necessary within the terms of this guarantee. To the extent Contractor was originally responsible for the work or materials (including Supervision) under the Contract documents, the Contractor further agrees to correct and repair promptly during that time all failures of any description and all settlements and shall deliver the work or materials in all respects in good condition and repair.

   b. **Failure to Make Repairs:**

      If at any time within the period of guarantee after the completion and acceptance of the work herein contracted for, the work shall, in the judgment of the County, require such repairs or reconstruction as above set out, County shall notify the Contractor. Should the Contractor refuse or neglect to begin to make such repairs within five (5) days from the date of serving such notice, the County shall have the right to cause such repairs or reconstruction to be made in such a manner as County shall deem best, and the cost thereof shall be paid by the Contractor and Contractor's sureties or deducted from the reserve fund.

   c. **Expiration of Guarantee Period:**

      It shall be the duty of the Contractor to notify the County, in writing, within thirty (30) days prior to the expiration of the guarantee period to inspect the work, and unless the Contractor shall furnish such notice, the obligation to maintain the said improvement in proper condition shall continue in force until thirty (30) days after such notice is sent by
the Contractor to the County.

d. Compliance with Laws:

The Contractor shall comply with all Federal and State Laws and County ordinances applicable to work.

e. Onsite Storage:

Sarpy County will not pay the Contractor for stored material(s) on the job site. It will be the responsibility of the Contractor to store materials for the contracted job elsewhere. If the Contractor chooses to store the material(s) on the job site it will be done at their own expense.
COUNTY PROVISIONS

1. **County Board**
The County Board of Sarpy County, Nebraska shall, in conjunction with the Engineer, be the final arbiter in all controversies concerning the fulfillment of this Contract. No changes in any of the details of the Plans and Specifications shall be made without approval of the Board. The Board shall approve final acceptance of the work and payment of the Contractor.

2. **Retained Percentage**
Sarpy County shall retain five percent (5%) of estimated amounts earned for partial payments. Upon final payment of the project, all retained monies shall be paid in full.

3. **Provisions and Technical Specifications**
All materials and all work shall conform to the current Nebraska Department of Roads “Standard Specifications for Highway Construction”, 2007 Edition, and any current or revisions or amendments thereto, which will be referenced as the “Standard Specifications,” except as modified by these project specifications.

4. **Field Conditions**
The Contractor shall have carefully examined the construction work sites to establish the field conditions prior to completing the bid. Contractor will not be entitled to additional compensation if it subsequently finds that conditions require methods or equipment other than what the Contractor originally anticipated.

5. **Preconstruction Meeting**
Contractor shall schedule and run a preconstruction meeting at least 48 hours prior to beginning construction. Representatives from Sarpy County Public Works, the Contractor, and any Subcontractors, shall be invited to discuss upcoming construction activities. Contact information for all representatives is provided in this document. The meeting shall take place at the Sarpy County Public Works building.

Sarpy County Public Works – Pat Dowse, 402-537-6917, pdowse@sarpy.com

OPPD - Joe Ostblom, 402-636-3513, jostblom@oppd.com

Charter Communications – Mike Bartholomew, 402-520-0363,

    Michael.Bartholomew2@charter.com

CenturyLink – Jack Dodendorf, 402-320-3421, jack.dodendorf@centurylink.com

6. **Period of Performance and Working Days**
Sarpy County and the Contractor shall agree on an expected start date, likely to be no earlier than January 8, 2018. Working days will begin to be tabulated beginning on the expected start date. The estimated contract period of performance is thirty (30) days.

Working days shall refer to all days when the temperature is above forty (40) degrees and rising
and which are suitable for the construction of this project, except Sundays and Holidays.

7. **Taxes**
   Sarpy County will, upon request, furnish the successful Contractor with a completed State of Nebraska Tax Exempt Form 13 upon acceptance of the successful Contractor’s proposal.

8. **Liquidated Damages**
   The time of completion is of the essence of the Contract because the County will be subject to additional financing and administrative expense if the work is not completed within the time period specified in the Agreement.

   Therefore the Contractor shall reimburse the County at the rate of **$500 per day** for each additional working day required to complete the work as defined above. The time allowed for completion of this Contract shall not be extended except upon written application, by the Contractor, requesting such extensions and explaining fully the necessity for such extension. Such extension will be considered only because of strikes, unavailability of properly ordered materials, or other causes beyond the Contractor’s control.

   Company warrants that pursuant to Neb Rev. Stat. 48-2101, et seq. (1994 Cum. Supp.) it has registered as a Contractor with the State of Nebraska, and that it and any and all subcontractors have obtained any and all necessary licenses and permits required by federal law, state law and/or county ordinances for the work described herein.

9. **Deviations**
   Once the bid has been accepted by Sarpy County, no deviations from the specifications will be accepted without prior written approval of Sarpy County.

10. **Exceptions**
    These specifications are minimum acceptable specifications. You may bid other than what is specified if it is of higher specification than what is requested. Contractor must list any exceptions to the bid specifications on the exceptions/clarifications/comments page provided.

11. **Company Information:**
    Contractor will provide the following company information on the bid form:
    a. Years in business;
    b. Number of employees; and,
    c. Total sales for last three (3) years.

12. **References:**
    Each Contractor must include with their proposal a list of no less than three (3) references that have purchased the specified product or service within the last two (2) years. The list must include the name of the company, and the name and phone number of a contact person for each company.

13. **Equipment/Safety**
    The Contractor shall be responsible for providing all equipment required to protect its employees, the public, surrounding areas, equipment and vehicles including but not limited to the placement of barricades, tarps, plastic flag tape and other safety/traffic control. The cost of
such equipment is considered subsidiary to the project and will not be paid for as a separate bid item.

14. **Cleaning**  
The Contractor shall keep the premises clean of all rubbish and debris generated by the work involved and shall leave the premises neat and clean.

15. **Maintenance of Traffic/Barricading**  
All signing, pavement marking, barricading and traffic control devices shall conform to the State of Nebraska Supplement to the Manual on Uniform Traffic Control Devices, 2011 and the Manual on Uniform Traffic Control Devices, current edition. No lane closures will be allowed without prior authorization from the Engineer.

Control of traffic and protection of the drainage structure is the responsibility of the Contractor until such time as the work is formally accepted by the County. Any damage to the drainage structure prior to such acceptance shall be remedied by the Contractor at Contractor’s expense.

16. **Damage to Property:**  
If any damage occurs to property during the performance of the contract, it shall be the responsibility of the contractor to make repairs and/or replacements.

17. **Access**  
Contractor is responsible for contacting all landowners prior to entering property. Contractor shall complete all work and store all materials and equipment at a safe location within the Right-of-Way. Contractor shall not enter private property without first acquiring permission.

18. **Erosion Control**  
Contractor shall conduct its operations in accordance with the requirements of the Authorization Discharge under the State of Nebraska National Pollutant Discharge Elimination System, NPDES Permit No. NER 160000 and the Papillion Creek Watershed Partnership (PCWP) Grading Permit Terms for the project. Copies of NPDES Permit No. 160000 and Papillion Creek Watershed Partnership (PCWP) Grading Permit Terms are available by contacting Sarpy County. The Contractor can request a copy from the County field representative. To the maximum extent possible all erosion control facilities shall be constructed prior to stripping of topsoil and beginning grading operations.

19. **Maintenance of Erosion Control**  
As described in the Standard Specifications, the Contractor shall be responsible for supplying, installing, maintaining, and removing all Temporary Erosion and Sediment Controls. All sediment removal and cleaning shall be subsidiary to the appropriate Temporary Erosion and Sediment Control bid item and will not be paid for separately.

20. **Notice to Stake**  
The Contractor shall provide staking for the project.

21. **Traffic Control**  
The Contractor shall conduct his operations in such a manner as to provide access to all adjacent
properties at all times. The roads to be improved shall be closed to through traffic for the duration of the project. The Contractor shall place and maintain proper barricades, lights, signs and other required safeguards around obstructions in or adjacent to existing streets and as necessary to provide advance warning. All barricades, lights, and warning signs shall conform to the Omaha Public Works "Barricading Standards, Specifications, Methods and Materials" and the "Manual on Uniform Traffic Control Devices."

22. **Mud and Construction Debris**
   The Contractor shall take the necessary precautions to keep mud and debris from being deposited onto existing pavement during construction operations. Should mud and debris become deposited upon such existing pavement, the Contractor shall promptly remove it at no additional cost to the County.

23. **Restarting Construction**
   The Contractor must notify Sarpy County personnel 24 hours prior to starting or restarting construction work if work sequence is interrupted due to any cause whatsoever, to allow for construction observation on this project. Bill Herr (Phone 402-537-6900, Email: herrb@sarpy.com).

24. **Road Restrictions Or Closures**
   The Contractor must notify Sarpy County personnel 48 hours prior to road closures: Bill Herr (Phone 402-537-6900, Email herrb@sarpy.com).

25. **Required Submittals**
   Submittals shall be provided to the Engineer as described in the Standard Specifications. Submittals for this project shall include but not be limited to the following:
   
   CMP Culverts
   Reinforcing Steel
   Concrete Mix Design
   Drainage Blanket
   Rock Rip Rap
   Rip Rap Filter Fabric
   Erosion Control
   Erosion Checks
   Seed Mix
   Rock Surface Course
   Soil Classification

26. **Department of the Army Nationwide Permit No. 14**
   Work shall be in conformance with the attached USACE Permit No. NWO-2016-02376-WEH. All Special Conditions, Regional Conditions and General Conditions contained within Permit No. NOW-2016-02376-WEH shall be met.
BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE

_____________________________________________________________________________________

As principal, and ______________________________________________________________

_____________________________________________________________________________________

as Surety, are held and firmly bound to the County of Sarpy, Nebraska, in the penal sum of

_____________________

to be paid to the COUNTY OF SARPY its successors or assigns, for which payment to be well and truly

made, we bind ourselves and each of us, and each of our heirs, executors, administrators, successors and

assigns, jointly and severally, firmly by these Presents.

Dated this ______ day of____________, 2017

The conditions of this obligation are such that:

WHEREAS, by even date herewith, the said principal has entered into a Contract with the said County of

Sarpy, Nebraska to perform the labor and furnish the material for

_____________________________________________________________________________________

NOW THEREFORE, the conditions of this obligation are such that if the said principal shall duly perform

and observe all of the stipulations and agreements in said Contract on his part to be performed and

observed, then and in that event, this obligation shall be void and of no effect, but otherwise shall be and

remain in full force and effect. It is expressly agreed that any alterations which may be made therein by

agreement between the said principal and the said County of Sarpy, Nebraska in the terms of said

Contract, or the nature of the work to be done thereunder, or the giving of any extension of time for

performing the said Contract, or of any of the stipulations therein contained, and on the part of the said

principal to be performed, or any other forbearance, shall not in any way release the said surety from this

liability under the above written bond.

It is further expressly agreed and understood that this bond shall stand as surety for the payment of all

accounts and claims that may be due by reason of laborers or mechanics wages for labor that shall be

performed, and for all material which is actually used in performing said Contract.

It is further expressly agreed and understand that this bond shall stand as maintenance surety for the

period of two (2) years on faulty materials and workmanship only. Nothing herein shall be construed to

cover wear and tear occasioned by action of the elements; excepting insofar as such wear and tear

discloses the use of improper materials or construction methods.
In testimony whereof, the said parties hereto have hereunto set their hands this ____ day of ______________________, 2017, and said Surety has caused these presents to be sealed with its Corporate Seal, and duly attested by the signature of its attorney-in-fact, and their authority is attached hereto and made a part thereof.

____________________________________
Principal

_______________________________
Witness

____________________________________
President

____________________________________
Witness

____________________________________
Surety

____________________________________
By:

____________________________________
Attorney-In-Fact
EXCEPTIONS/CLARIFICATIONS/COMMENTS

1. ___________________________________________________________________________
2. ___________________________________________________________________________
3. ___________________________________________________________________________
4. ___________________________________________________________________________
5. ___________________________________________________________________________
6. ___________________________________________________________________________
7. ___________________________________________________________________________
8. ___________________________________________________________________________
9. ___________________________________________________________________________
10. ___________________________________________________________________________
The undersigned, having carefully examined the Plans and Specifications, and having examined
the project areas, hereby submit our proposal.

Attached hereto is a Bid Bond in the amount of 5% of the amount bid made payable to the Sarpy
County Treasurer, which is agreed shall be forfeited should the undersigned fail to perform or fail
to furnish bond and securities in accordance with the proposal.

For furnishing all materials, labor, equipment, tools, together with appurtenances and
accessories required to prepare, construct, erect and install the proposed improvements, complete and
ready for operation, our bid as follows:

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<th>QUANTITY</th>
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<td><strong>GRAND TOTAL</strong></td>
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*Prices are to be F.O.B. - Sarpy County, Nebraska*

**CONTRACTOR START DATE:**

If notified of acceptance of this proposal and Contract award within sixty (60) days after date stated for receipt of bids, the undersigned agrees to execute a Contract, provide insurance certificates and performance bonds for the above named work and the above stated consideration in the form required within ten (10) days of such proposal acceptance notification; to commence the work within five (5) days of the Contractor’s Notice to Proceed.  **Substantial Completion shall occur within thirty (30) working days of the commencement of work as described above to avoid accrual of liquidated damages.**  **Final Completion shall be within thirty (30) calendar days of Substantial Completion.**

Total bid shall be the basis for establishing the amount of the Performance Bond in this Contract.  The Total Bid is based on the quantities shown in the Proposal Form and on the dimensions shown in the Plans where specific quantities are not itemized, and is subject to additions or reductions according to the actual construction quantities as determined by the Engineer.  Any such change orders shall be made by and become a part of the Engineers Certified Progress Statement(s) of work in progress as well as final completed construction (Project Completion Report(s)).

The undersigned has carefully checked the bid blank quantities against the Plans and Specifications before preparing this Proposal and accepts the said quantities and amounts, as correctly listing the
complete work to be done in accordance with the Plans and Specifications.

The County Board reserves the right to waive informalities and irregularities and to award bids which furnish the material and construction that, in their opinion, will serve in the best interest of the County or to reject any/or all bids.

The undersigned also agrees that the time of commencement, rate of progress and time of completion of the work of the Contract are ESSENTIAL CONDITIONS of the Contract and that the County may retain a sum of one five hundred ($500.00) per calendar day from the sum due under the Contract for each calendar day that the Contract is not completed as described above.

**Company Information:**

Years in business: ____________________________

# of employees: ____________________________

Total sales last 3 years:

________________________

________________________

________________________

**References:**

Company Name: ____________________________________________________________
Address: _________________________________________________________________
Contact Name: _______________________________ Phone Number: ____________________________
Fax Number: ___________________________ Date of Purchase: ____________________________

Company Name: ____________________________________________________________
Address: _________________________________________________________________
Contact Name: _______________________________ Phone Number: ____________________________
Fax Number: ___________________________ Date of Purchase: ____________________________

Company Name: ____________________________________________________________
Address: _________________________________________________________________
Contact Name: _______________________________ Phone Number: ____________________________
Fax Number: ___________________________ Date of Purchase: ____________________________

I certify that this bid is submitted in accordance with the specifications issued by Sarpy County. I affirm that the original Specifications have not been altered in any way. Any alteration of the original Specifications, outside of an alternate bid, may be considered grounds for refusal of the bid.

The undersigned acknowledged receipt of the following addenda (if applicable):
CONTRACTOR: ________________________________

Addendum #1 ____________________________
Addendum #2 ____________________________

________________________________________  __________________________________________
Company Name                               Company Representative (Please print)

________________________________________  __________________________________________
Authorized Signature                         Telephone Number

________________________________________  __________________________________________
Address                                      Fax Number

________________________________________  __________________________________________
City, State & Zip                             E-Mail Address

*NOTE: Sarpy County is tax exempt and will provide the proper form upon request
EXHIBIT A
CONTRACT AGREEMENT

THIS CONTRACT is made and entered into in DUPLICATE by and between Sarpy County, Nebraska hereinafter called County, and _______________ hereinafter called Contractor.

In consideration of the following mutual agreements and covenants, it is understood and agreed by the parties hereto that:

1. The Contractor does hereby agree to undertake and construct Sarpy County Project C-77 (15-14), Pflug Road, 228th Street to 230th Street, Culvert Replacement
Also referred to hereinafter as work, in accordance with terms and provisions hereof and subject to the quality provisions in the accepted Proposal of Contractor for the sum of $_______________________________________________________________________ (written) under penalty of Performance, Payment and Guarantee Bond.

2. The Contractor shall conform with the applicable plans and specifications, applicable Special Provisions and any applicable change order or addenda pertaining thereto or to this Contract, all of which by reference thereto are made a part hereof. Applicable notice to bidders, Instruction to bidders, Bid Proposal of Contractor, Resolution awarding this Contract, the Performance, Payment and Guarantee Bond and all proceedings by the governing body of the County relating to the aforesaid work are made a part hereto by reference thereto.

3. The County agrees to pay the Contractor in accordance with the provisions of the specifications, the accepted Proposal of the Contractor and the provisions of this Contract.

4. All provisions of each document and item referred to in Paragraph 2 above shall be strictly complied with the same as if rewritten herein, and in the event of conflict among the provisions of said documents, the provisions most favorable to the County shall govern, and substitution or change shall be made except upon written direction, the form of which shall be written “Change Order” of the County; and substitution or change shall in no manner be construed to release either party from any specified or implied obligation of this Contract except as specifically provided for in the Change Order.

5. The Contractor warrants that it has neither employed nor retained any company or person, other than bona fide employee working for Contractor to solicit or secure this Contract, and that Contractor has not paid or agreed to pay any company or person, other than a bona fide employee, any fee, commission percentage, brokerage fee, gift or any other consideration, contingent upon or resulting from the award or making of this Contract. For breach or violation of this warranty, County shall have the right to annul this Contract without liability, or in its discretion, to deduct from the Contract price or consideration, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

6. County and Contractor promise and agree to comply with all Federal and State laws and County ordinances, and such other rules and regulations as may apply to this Contract, including but not limited to: the Americans with Disabilities Act of 1990 (29 U.S.C.A. 12101, et seq.); the Rehabilitation Act of 1973 (29 U.S.C.A. 701, et seq.); and the Drug Free Workplace Act of 1988 (41
Furthermore, pursuant to Neb. Rev. Stat. 73-102 Reissue 1990, County and Contractor declare, promise, and warrant that they have and will continue to comply fully with the Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C.A. 1985, et seq.); and the Nebraska Fair Employment Practice Act, Neb. Rev. Stat. 48-1101, et seq., (Reissue 1993), in that there shall be no discrimination against any person who is employed in the performance of this Contract, or against any applicant for such employment, because of age, color, national origin, race, religion, creed, disability or sex.

7. The Contractor shall indemnify and save harmless Sarpy County, its officers, employees, agents and representatives from all claims, suits or actions of every kind and character made upon or brought against the said Sarpy County, its officers, employees, agents and representatives for on or account of any injuries or damages received or sustained by any party or parties by or from the acts or omissions of the said Contractor or its servants, agents, representatives and subcontractors, in doing the work herein contracted for or by or in consequence of any negligence in guarding the same or any improper material used in its construction or by or on account of any act or omission of said Contractor or its servants, agents, representatives and subcontractor or its servants, agents, representatives and subcontractors arising out of any manner connected with the performance of this Contract, and also from all claims or damage for infringement of any patent in fulfilling this Contract.

8. The Contractor agrees to comply with the residency verification requirements of Neb. Rev. Stat. §4-108 through §4-114. The Contractor is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of a newly hired employee.

If the Contractor is an individual or sole proprietorship, the following applies:

1. The Contractor must complete the United States Citizenship Attestation Form, available on the Department of Administrative Services website at www.das.state.ne.us.

2. If the Contractor indicates on such attestation form that he or she is a qualified alien, the Contractor agrees to provide the U.S. Citizenship and Immigration Services documentation required to verify the Contractor’s lawful presence in the United States using the Systematic Alien Verification for Entitlements (SAVE) Program.

3. The Contractor understands and agrees that lawful presence in the United States is required and the Contractor may be disqualified or the contract terminated if such lawful presence cannot be verified as required by Neb. Rev. Stat. Sect. 4-108.

9. Insurance Requirements

The Contractor shall not begin work under this Agreement until all insurance certificates have
been filed with the Sarpy County Clerk.

The following insurance coverages shall be kept in force during the life of the Agreement and shall be primary with respect to any insurance or self-insurance programs covering the County, its commissioners/supervisors, officials, agents, representatives and employees. These insurance coverages shall specifically state, or be endorsed to state, that thirty (30) days notice shall be given to the County in the event of cancellation of, or material change in, any of the coverages.

a. **Worker’s Compensation and Employers Liability Insurance**

The minimal acceptable limits shall be the statutory limits as required by the State of Nebraska for Coverage A, Workers’ Compensation and $500,000 each accident for Coverage B, Employers Liability.

b. **Commercial General Liability Insurance**

Coverage should include broad form coverage written on a commercial general liability form and written on an occurrence basis. The coverage must protect against claims for damages resulting from bodily injury, including death, personal injury and property damage.

The minimum acceptable limits of liability shall be $1,000,000 each occurrence. If the coverage contains a general aggregate, such limit shall not be less than $2,000,000. The products/completed operations limit shall not be less than $2,000,000. The County shall be named as an additional insured on the insurance coverage required under this section.

c. **Automobile Liability Insurance**

Coverage shall be against claims for damages resulting from bodily injury, including death and property damage, which may arise from the operations of any owned, hired or non-owned automobile. The minimum acceptable limit of liability shall be $1,000,000 Combined Single Limit for each accident. The County is to be named as an additional insured on the insurance coverage required under this section.

d. **Certificate of Insurance**

The Contractor shall furnish the County with a certificate(s) of insurance evidencing the coverage required in this section. If the certificate(s) is shown to expire prior to completion of all the terms of this Agreement, the Contractor shall furnish a certificate(s) of insurance evidencing renewal of its coverage to the County. The County is to be included as an additional insured on the insurance coverage required under this section.

The Contractor shall require each and every Subcontractor performing work under this Agreement to maintain the same coverages required of the Contractor in this Section, and upon the request of the County, shall furnish the County with a certificate(s) of
insurance evidencing the Subcontractor’s insurance coverages required in this section.

f. **Insurance Company**

All insurance coverages herein required of the Contractor shall be written by an insurance company or companies transacting business as an admitted insurer in the State of Nebraska or under the Nebraska Surplus Lines Insurance Act. All insurance companies must possess a minimum A.M. Best Insurance Company rating of A-.

Upon request by the County, the Contractor shall furnish evidence that the insurance company or companies being used by the Contractor meet the minimum requirements listed in this section.

Upon request by the County, the Contractor shall furnish the County with complete and accurate copies of the insurance policies required within this section. If at any time during the life of this Contract, the Contractor’s insurance coverages and limits do not meet or exceed the minimum insurance requirements presented in this section, the Contractor is required to notify the County of any deviations from the minimum requirements presented in this section.

10. The Contractor shall pay to the Unemployment Compensation Fund of the State of Nebraska unemployment contributions and interest due under the laws of the State of Nebraska on wages paid to individuals employed in the performance of this Contract, and shall submit to Sarpy County written clearance from the Commissioner of Labor of the State of Nebraska certifying that all payments due of contributions and interest which may have arisen under this Contract have been paid by the Contractor or his subcontractor, to the State of Nebraska Unemployment Compensation Fund. Payment of the final five percent (5%) of the total amount of the Contract shall be withheld until this provision have been complied with as required by Section 48-657 R.R.S. 1943, as amended.

11. The Contractor shall not, in performance of this Agreement, discriminate or permit discrimination against any person because of race, sex, age or political or religious options or affiliations in violation of federal or state laws or local ordinances and further the Contractor shall comply with Sarpy County ordinances pertaining to civil rights and human relations.

12. The Contractor shall procure a policy or policies of insurance which shall guarantee payment of compensation according to the Workmen’s Compensation Laws of Nebraska for all workmen injured in the scope of employment; and further agrees to keep said policy or policies in full force by the Contractor throughout the term of this Contract. Certificates of insurance or copies of policies if required by any department of the County, shall be filed by the Contractor with Sarpy County.

13. Except as may otherwise be required by applicable law payment of any balance due to the Contractor under this Contract shall be made by the County to the Contractor upon completion of the Contractor’s work and obligations in accordance with the Contract, upon acceptance thereof by the County, and upon submission of certificate by the Contractor in accordance to above. No payment by the County shall in any way constitute any waiver of any rights of Sarpy
14. Pursuant to Neb. Rev. Stat. 23-3113, the Parties hereto declare and affirm that no officer, member, or other employee of the County, and no member of its governing body, and no other public official of the County who exercises any functions or responsibilities in the review or approval of the undertaking described in this Contract, or the performing of services pursuant to this Contract shall participate in any decision relating to this contract which effects his or her personal interest, or any corporation, partnership, or association in which he or she is directly or indirectly interested; nor shall any employee of the County, nor any member of its governing body, have any interest, direct or indirect, in this Contract or the proceeds thereof.

15. Neither County nor Contractor shall engage the services of any person or persons presently in the employ of the other for work covered by this Contract without the express written consent of the employer of such person or persons.

16. Each party declares, represents, warrants and acknowledges that it is not an agent for the other now, nor will it be in the future. Each party is an independent Contractor, and neither party is or will become the employee of the other as a result of the relationship created by this Contract.

17. It is understood and agreed by the parties hereto that if any part, term, condition or provision of this Contract is held to be illegal or in conflict with any law of this State or of the United States, the validity of the remaining parts, terms, conditions, or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Contract did not contain the particular part, term, condition, or provisions held to be invalid.

18. This Contract and documents incorporated herein by reference contain the entire Contract between the Parties, and there are no other written or oral promises, agreement or warrants which may affect it.

19. The Contractor acknowledges that it is, and will, remain fully obligated under the provisions of this Contract, regardless of any delegation of duties or assignment or benefits hereunder. Contractor further acknowledges and promises that the provisions of this Contract shall be made binding on any Subcontractor(s) it may retain. Contractor shall require that all Subcontractors hold County harmless from any and all claims and causes of action resulting from actions or activities of Subcontractor. Contractor shall require that all Subcontractors comply with any and all applicable State and Federal laws and that Subcontractor(s) obtain any and all necessary permits or licenses necessary to conduct work under this Contract.

20. Contractor may not subcontract or assign any portion of Contract without prior written approval from the County.

21. Contractor expressly guarantees all work and materials as described herein.
This Contract cannot be amended except by written agreement of both parties. Notice to the Parties shall be given in writing to the agents of each party named below:

County: Ms. Deb Houghtaling
Sarpy County Board Business Office
1210 Golden Gate Dr., Suite 1250
Papillion, NE 68046

Contractor: ______________________
______________________________
______________________________
______________________________

IN WITNESS WHEREOF, the parties hereto have caused these instruments to be executed in THREE original counterparts, this as of this ___ day of ____________, 2017.

County of Sarpy, Nebraska
(SEAL) A Body Politic and Corporate

CHAIRMAN: ______________________

ATTEST: ______________________

CLERK: ______________________

APPROVED AS TO FORM:

______________________________
COUNTY ATTORNEY/DEPUTY

______________________________
CONTRACTOR: ______________________

ATTEST:

______________________________
SECRETARY/WITNESS

______________________________
PRESIDENT: ______________________
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NEBRASKA REGULATORY OFFICE
8901 SOUTH 154TH STREET, SUITE I
OMAHA, NEBRASKA 68138-3635


November 9, 2017

Sarpy County Public Works

DEPARTMENT OF THE ARMY NATIONWIDE PERMIT VERIFICATION

Permittee: Pat M. Dowse
Sarpy County Highway Department
15100 South 84th Street
Papillion, Nebraska 68046

Permit No: NWO-2016-02376-WEH

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term “this office” refers to the appropriate district or division office of the U.S. Army Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions of Department of the Army (DA) Nationwide Permit (NWP) No. 14 found in the January 6, 2017, Federal Register (82 FR 1860), Issuance and Reissuance of Nationwide Permits. You must comply with all special, regional and general conditions attached herein.

Project Waterway and Location:
Tributary to Western Sarpy Ditch and Abutting Wetlands
Sections 27 and 22, Township 13 North, Range 10 East
41.07421°, -96.27480°
Sarpy County, Nebraska

Project Name: Pflug Road Drainage Phase II

Date of Receipt: September 9, 2017

Additional Information Received: September 13, 2017

Project Description:
Sarpy County is proposing the replacement of a culvert that crosses underneath Pflug Road. Work will consist of the following:

Emergency Culvert Extension: In April 2017, the existing 48-inch by 68-foot culvert was extended 72 feet as an emergency measure to protect Pflug Road from collapsing.

Culvert Replacement: The existing 48-inch by 140-foot CMP (which includes the emergency extension) will be replaced with a twin 72-inch by 250-foot CMP with 80 feet of Type B riprap dissipation at the outlet and 37 linear feet of bank stabilization with Type B rock riprap.

Permanent impacts to waters of the United States include 72 linear feet of R4SB stream channel associated with the prior emergency culvert extension done in April, 2017, 110 linear feet of R4SB stream channel associated with the culvert replacement, 117 linear feet of R4SB stream bank stabilization, and 0.011 acre of PEMA/C riverine channel wetlands.
Special Conditions:
1. The permittee shall notify the Nebraska Regulatory Office of any design changes to the proposed project. Notification must be received in our office for review a minimum of 14 days prior to construction.

2. Concurrent with construction, silt curtains or other sediment control measures will be employed to reduce soil erosion and sedimentation into waters of the U.S. (WOUS). The amount of sediment entering WOUS and leaving the site shall be reduced to the maximum extent practicable. If the permittee fails to institute all appropriate measures, the U.S. Army Corps of Engineers (Corps) reserves the option to halt all earthmoving operations until the erosion/sedimentation problems are corrected.

3. Any temporary fill (e.g. construction debris, etc.) discharged below the ordinary high water mark shall be removed on a daily basis. All debris shall be disposed of upland in such a manner that it cannot enter any wetlands or WOUS.

4. Construction mats or timber mats must be used to minimize heavy machinery impacting any wetlands or waters of the U.S. All mats will be removed upon completion of construction and any disturbance of wetlands or waters of the U.S. will be restored by minor grading to preconstruction conditions. Disturbed areas will be seeded and erosion control measures will be implemented as appropriate.

5. The permittee is responsible for ensuring that the Corps is notified of the location of any borrow site that will be used in conjunction with the construction of the authorized activity so that the Corps may evaluate the site for potential impacts to aquatic resources, historic properties, and endangered species. The permittee shall not initiate work at the borrow site in conjunction with the authorized activity until approval is received from the Corps.

6. The placed riprap/broken concrete must be covered, from the top down to the annual ordinary high water line, with a minimum of 6 inches of soil compacted into the voids of the riprap and immediately seeded with either annual rye grass, oats and/or wheat (nurse crop) plus a mixture of native grass species. The Corps must be notified that this has been completed with photo documentation and seed tags.

Regional Conditions:
The permittee is responsible for compliance with the Nebraska Regional Conditions listed below.

Regional Condition No. 9, Revegetation of Disturbed Areas – All NWPs.

a. All areas adjacent (contiguous, bordering, neighboring) to jurisdictional waters disturbed by construction shall be revegetated with appropriate perennial, native grasses and forbs and maintained in this condition. In accordance with Executive Order 13112, the use of invasive species and non-native species is not appropriate for revegetation of disturbed areas. A cover crop may be planted to aid in the establishment of native vegetation. The disturbed areas shall be reseeded concurrently with the project or immediately upon completion. Revegetation shall be acceptable when ground cover of appropriate perennial, native grasses and forbs reaches 75%. If this seeding cannot be accomplished by September 15 in the year of project completion, then an erosion blanket shall be placed on the disturbed areas. The erosion blanket shall remain in place until ground cover of appropriate perennial, native grasses and forbs reaches 75%. If the seeding can be accomplished by September 15, all seeded areas shall be properly mulched to prevent erosion.

b. When the vegetation has become established, all temporary erosion control materials shall be
removed from the project site. Biodegradable or photodegradable materials need not be removed.

Regional Condition No. 10, Temporary Structures/Work/Fill

a. **All NWP**s

   i. The use of dredged material in the construction of temporary structures or used for temporary work or used as temporary fill shall not be allowed. The term “dredged material” is defined as material that is excavated or dredged from waters of the U.S. All temporary fill material shall be obtained from an upland source.

   ii. Upon completion of the construction activity, all temporary fill material shall be removed in its entirety from the water of the U.S. to an upland area and the affected area shall be restored to its pre-construction condition. Wetlands disturbed by temporary construction shall be seeded with appropriate native hydrophytic species.

   iii. General Condition No. 13 (Removal of Temporary Fills) is amended by adding the following: When temporary fills are placed in wetlands, a horizontal marker (i.e. fabric, certified weed-free straw, a ground survey with minimum accuracy of 0.10-foot, etc.) must be used to demarcate the existing ground elevation of wetlands that will be temporarily filled during construction, in order to restore the wetlands to pre-project conditions.

b. **NWP**s with a Preconstruction Notification (PCN) Requirement

   In addition to the above Regional Conditions in “a”, the following apply to NWP with a PCN requirements.

   i. A proposal for the temporary structure/work/fill, if not already provided, shall be submitted 14 days prior to construction and authorized/verified by the Nebraska Regulatory Office prior to the commencement of construction.

   ii. The Nebraska Regulatory Office shall be notified with documentation (i.e. photos) when the site has been restored to its pre-project condition.

**General Conditions:**

Please refer to the NWP 14 Fact Sheet.

**Further Information:**

1. Upon completion of the authorized work and any required mitigation, please sign and return the attached Compliance Certification form to the address listed.

2. **This NWP verification is valid until March 18, 2022, which is the expiration date for this NWP.** Should your project plans change, or if your activity has not commenced or under contract to commence by March 18, 2022, you must contact this office in writing for another permit determination. We will issue a public notice when the NWP are reissued. Furthermore, if you commence or are under contract to commence the authorized activity before March 18, 2022, you will have twelve (12) months from that date to complete the activity under the present terms and conditions of this NWP. If you need more than one additional year to complete the authorized activity, or if work has not commenced and is not under contract to commence, you will need to obtain a new verification under the 2022 NWP or have the remaining work authorized by another type of DA Permit.

3. Although an individual DA permit will not be required for the project, this does not eliminate the requirement that you obtain any other applicable federal, state, tribal or local permits as required. Please note that deviations from the original plans and specifications of your project could require additional authorization from this office.
4. You are responsible for all work accomplished in accordance with the terms and conditions of the Nationwide Permit. If a contractor or other authorized representative will be accomplishing the work authorized by the Nationwide Permit in your behalf, it is strongly recommended that they be provided a copy of this letter and the attached conditions so that they are aware of the limitations of the applicable Nationwide Permit. Any activity that fails to comply with all of the terms and conditions of the Nationwide Permit will be considered unauthorized and subject to appropriate enforcement action.

5. The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. If you do not have internet access, you may call and request a paper copy of the survey that you can complete and return to us by mail or fax.

6. If you have any questions concerning this verification, please feel free to contact Ms. Laura Banker at the above address or call (402) 896-0896 or e-mail at Laura.Banker@usace.army.mil and refer to file number NWO-2016-02376-WEH.

Signed

[Signature]
John L. Moeschen
Nebraska State Program Manager

Enclosure

cc:
NDEQ (Inman)
SP (Vagts)
Nationwide Permit 14

Linear Transportation Projects

Activities required for crossings of waters of the United States associated with the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) The loss of waters of the United States exceeds 1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 32.)

(Authorities: Sections 10 and 404)

Note 1: For linear transportation projects crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Linear transportation projects must comply with 33 CFR 330.6(d).

Note 2: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under section 404(f) of the Clean Water Act (see 33 CFR 323.4).
Note 3: For NWP 14 activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, “District Engineer’s Decision.” The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.


(a) No activity may cause more than a minimal adverse effect on navigation.
(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee’s expense on authorized facilities in navigable waters of the United States.
(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements.

No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity’s primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.
3. **Spawning Areas.**

Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. **Migratory Bird Breeding Areas.**

Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. **Shellfish Beds.**

No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. **Suitable Material.**

No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. **Water Supply Intakes.**

No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. **Adverse Effects from Impoundments.**

If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. **Management of Water Flows.**

To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-
construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. **Fills Within 100-Year Floodplains.**

The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. **Equipment.**

Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. **Soil Erosion and Sediment Controls.**

Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. **Removal of Temporary Fills.**

Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. **Proper Maintenance.**

Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. **Single and Complete Project.**

The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. **Wild and Scenic Rivers.**

(a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.
(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. Tribal Rights.

No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

18. Endangered Species.

(a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify
the non-Federal applicant of the Corps’ determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have “no effect” on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take” means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide Web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/respectively.


The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether “incidental take” permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

(a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.

(d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will
notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.


If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters.

Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.
(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.
(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation.
The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or
in-lieu credits are not available at the time the PCN is submitted to the district engineer, the
district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be
sufficient to ensure that the authorized activity results in no more than minimal individual and
cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)).

(3) Since the likelihood of success is greater and the impacts to potentially valuable
uplands are reduced, aquatic resource restoration should be the first compensatory mitigation
option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is
responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be
used by the district engineer to make the decision on the NWP verification request, but a final
mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14)
must be approved by the district engineer before the permittee begins work in waters of the
United States, unless the district engineer determines that prior approval of the final mitigation
plan is not practicable or not necessary to ensure timely completion of the required compensatory
mitigation (see 33 CFR 332.3(k)(3)).

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the
mitigation plan only needs to address the baseline conditions at the impact site and the number of
credits to be provided.

(6) Compensatory mitigation requirements (e.g., resource type and amount to be
provided as compensatory mitigation, site protection, ecological performance standards,
monitoring requirements) may be addressed through conditions added to the NWP authorization,
instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the
acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot
be used to authorize any NWP activity resulting in the loss of greater than 1/2- acre of waters of
the United States, even if compensatory mitigation is provided that replaces or restores some of
the lost waters. However, compensatory mitigation can and should be used, as necessary, to
ensure that an NWP activity already meeting the established acreage limits also satisfies the no
more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-
responsible mitigation. When developing a compensatory mitigation proposal, the permittee
must consider appropriate and practicable options consistent with the framework at 33 CFR
332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-
responsible mitigation may be environmentally preferable if there are no mitigation banks or in-
lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to
the permittee. For permittee-responsible mitigation, the special conditions of the NWP
verification must clearly indicate the party or parties responsible for the implementation and
performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely
affected by a regulated activity, such as discharges of dredged or fill material into waters of the
United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a
permanently maintained utility line right-of-way, mitigation may be required to reduce the
adverse environmental effects of the activity to the no more than minimal level.
24. **Safety of Impoundment Structures.**

To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. **Water Quality.**

Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. **Coastal Zone Management.**

In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. **Regional and Case-By-Case Conditions.**

The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. **Use of Multiple Nationwide Permits.**

The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. **Transfer of Nationwide Permit Verifications.**

If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the
appropriate Corps district office to validate the transfer. A copy of the nationwide permit
verification must be attached to the letter, and the letter must contain the following statement and
signature:

When the structures or work authorized by this nationwide permit are still in existence at
the time the property is transferred, the terms and conditions of this nationwide permit,
including any special conditions, will continue to be binding on the new owner(s) of the
property. To validate the transfer of this nationwide permit and the associated liabilities
associated with compliance with its terms and conditions, have the transferee sign and
date below.

_________________________ (Transferee) ________________ (Date)

30. Compliance Certification.

Each permittee who receives an NWP verification letter from the Corps must provide a signed
certification documenting completion of the authorized activity and implementation of any
required compensatory mitigation. The success of any required permittee-responsible mitigation,
including the achievement of ecological performance standards, will be addressed separately by
the district engineer. The Corps will provide the permittee the certification document with the
NWP verification letter. The certification document will include:
(a) A statement that the authorized activity was done in accordance with the NWP authorization,
including any general, regional, or activity-specific conditions;
(b) A statement that the implementation of any required compensatory mitigation was completed
in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program
are used to satisfy the compensatory mitigation requirements, the certification must include the
documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the
appropriate number and resource type of credits; and
(c) The signature of the permittee certifying the completion of the activity and mitigation. The
completed certification document must be submitted to the district engineer within 30 days of
completion of the authorized activity or the implementation of any required compensatory
mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States.

If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it
will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers
(USACE) federally authorized Civil Works project (a “USACE project”), the prospective
permittee must submit a pre-construction notification. See paragraph (b)(10) of general
condition 32. An activity that requires section 408 permission is not authorized by NWP until the
appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE
project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification.
(a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

1. He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or
2. 45 calendar days have passed from the district engineer’s receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is “no effect” on listed species or “no potential to cause effects” on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until an individual permit has been obtained. Subsequently, the permittee’s right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

1. Name, address and telephone numbers of the prospective permittee;
2. Location of the proposed activity;
3. Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;
4. A description of the proposed activity; the activity’s purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the
Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act.

(8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the “study river” (see general condition 16); and

(10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include
a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination:

(1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity’s compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity’s adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district will fully consider agency comments received within the specified time frame concerning the proposed activity’s compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies’ concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.
5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

**Further Information**

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).
INDEX OF SHEETS

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2-A1 SUMMARIZE QUANTITIES
2-A1 ANNOTS
2-A1-H1 HORIZONTAL ALIGNMENT & CONTROL POINTS
2-A1 - 2-A3 GENERAL INFORMATION
2-A1 DESIGN & TOLERANCE
2-A1 FOUNDATION PLAN
3 SLAB & PRECAST SHEETS
4 FOUNDATION STRUCTURE CROSS SECTIONS
5 - 9 SPECIAL PLANS
10 - 15 RIGHT-OF-WAY PLANS
16 - 18 CROSS SECTIONS

SARPY COUNTY, NEBRASKA

PFLUG ROAD
PLANS FOR CONSTRUCTION
SARPY COUNTY

THE DATE EDITION OF THE NEBRASKA STANDARD SPECIFICATIONS
AND THE SPECIAL PROVISIONS APPLY TO THIS PROJECT.

ANY REFERENCE TO THE NEBRASKA DEPARTMENT OF ROADS
OR THE STATE OF NEBRASKA STANDARD SPECIFICATIONS OR
HIGHWAY CONSTRUCTION OR SPECIAL PROVISIONS SHALL NOT
CONSTITUTE REFERENCE TO SARPY COUNTY, ITS EMPLOYEES,
OR REPRESENTATIONS MADE BY SARPY COUNTY AS A CONSENT
FOR CONSTRUCTION PROJECT MANAGEMENT, INFORMATION OR
TESTING SERVICES.

CONTRACTOR MAY OBTAIN COPIES OF THIS
MANUAL & SPECIFICATIONS FROM
SARPY COUNTY PUBLIC WORKS
15100 S. 84th Street
Papillion, NE 68046
(402) 537-4300

ROAD CLOSED TO TRAFFIC
CONTRACTOR TO PROVIDE TRAFFIC CONTROL. TRAFFIC CONTROL
SHALL BE IN COMPLIANCE WITH THE FEDERAL HIGHWAY ADMINISTRATION'S
MANUAL ON WORK ZONE TRAFFIC CONTROL DEVICES, PART VI (MUTCD).

TRAFFIC CONTROL SHALL BE PAID FOR AS EAGER 5% AND INCLUDES ALL
WORK AND MATERIALS REQUIRED TO EFFECT, INSTALL, AND MAINTAIN
TRAFFIC CONTROL MEASURES CONSISTENT WITH THE EXISTING DETOUR
PREVIOUSLY ESTABLISHED BY SARPY COUNTY PUBLIC WORKS PRIOR
TO ISSUING EACH BID. CONTRACTOR IS RESPONSIBLE FOR COMPLETING THE
EXTENT OF THE SCOPE OF WORK TO BE PERFORMED.

PRIOR TO CONSTRUCTION

CALL: 1-800-331-5666 OR 811
FOR LOCATION OF UNDERGROUND UTILITIES.

NOTE: EXISTING UNDERGROUND AND SURFACE UTILITIES AND
ROADWAY STRUCTURES HAVE BEEN PLANNED FOR AVAILABILITY
INFORMATION AND TESTED. OTHER LOCATIONS MUST BE
CONSIDERED APPROPRIATE ONLY. IT IS THE RESPONSIBILITY
OF THE INDIVIDUAL CONTRACTORS TO EXACTLY LOCATE AND
PROTECT EACH EXISTING UTILITY APPEAR AND BURIED UTILITY
CONSTRUCTION.
NOTE:
Riprap above approximate ordinary high water elevation 1107.50 shall be covered by a minimum 6 inches of soil. Soil shall be compacted and seeded. This work shall be Subsidiary to other bid Items.
See Permit No. NWQ-2016-02376-WEH

EXISTING GROUND

WEST BANK GRADING
STA. 27+57, 143' LT. - STA. 27+67, 245' LT.
### SUMMARY OF QUANTITIES

#### SUMMARY OF QUANTITIES

<table>
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<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>UNITS</th>
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<tr>
<td>INDOOR Nz</td>
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<td>27&quot; CULVERT, TYPE 6</td>
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#### COMPACTION REQUIREMENTS

**Class III (See Specifications)**

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<th>Percentage Moisture Requirement</th>
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</tbody>
</table>

The natural text of the document includes a table listing various items and their quantities, as well as a second table detailing compactation requirements for Class III (as per specifications).
CONTROL POINT TIES

PFLUG ROAD (PFLUGROAD)
Chain PFLUGROAD contains:
Beginning Chain PFLUGROAD description
Point PFLUGROAD1 x 2,666,920.58 y 474,021.22 sta 10-00.00
Course from PFLUGROAD1 to PFLUGROAD2 W 87° 16' 02.15" E Dist 2,642.62
Point PFLUGROAD2 x 2,667,660.21 y 474,147.21 sta 36+42.62
Ending chain PFLUGROAD description

WEST BANK GRADING (BASELINE CHANNEL)
Chain BASELINE CHANNEL contains:
Beginning chain BASELINE CHANNEL description
Point1 x 2,666,748.74 v 474,212.98 sta 26+24.72, 104.89' LTL
Point2 x 2,666,948.73 v 474,248.18 sta 27+56.87, 143.15' LTL
Point3 x 2,667,109.95 v 474,309.94 sta 27+57.22, 245.18' LTL
Ending chain BASELINE CHANNEL description
NOTES

- Prior to bidding the project, each bidder shall visit the site and satisfy themselves with the surface & sub-surface conditions. Each bidder shall also fully inform themselves of the extent of the scope of work to be performed.

- The final survey information shown on the plans represents the existing topographical conditions as best could be determined based on the original survey conducted in 2016.

- The locations of all aerial and underground utility facilities may not be indicated in the survey made. The underground utilities whether exposed or not will be located and flagged by the utilities of the request of the Contractor.

- The Contractor shall provide for all underground utility facilities until all such facilities have been located and flagged to the satisfaction of the Engineering. The location of all underground utility facilities must be shown on the plans.

- Any excavations shall be carried out with extreme care in order to avoid any damage to the utility facilities.

- The Contractor shall be required to furnish Borrow on this Project.

- All Borrow to be obtained shall be furnished Borrow on this Project.

- All Borrow to be obtained shall be furnished Borrow on this Project.

- Contractor must implement erosion control methods during construction to provide necessary/adequate discharge. Contractor shall install and maintain erosion control as shown on the plans. Contractor shall dispose of all material as directed by the Engineer. The cost for disposal of any material shall be subsidiary to the Contractor.

- Contractor shall dispose of all unsuitable materials encountered in the removal or grading operations of the project site. All unsuitable materials, as determined by the Engineer, shall be used for backfilling or other purposes.

- Excavation shall be limited to sites provided by the Contractor, the Contractor shall be the authority for the use of the work is limited to the Contractor.

- Locations that, in the opinion of the Engineer, must be removed, and delivered to the Contractor, Locations that, in the opinion of the Engineer, must be removed, and delivered to the Contractor, shall be Subsidiary to other Items.

- The Contractor shall dispose of all unsuitable materials encountered in the removal or grading operations of the project site. All unsuitable materials, as determined by the Engineer, shall be used for backfilling or other purposes.

- Excavation shall be limited to sites provided by the Contractor, the Contractor shall be the authority for the use of the work is limited to the Contractor.

- Locations that, in the opinion of the Engineer, must be removed, and delivered to the Contractor, Locations that, in the opinion of the Engineer, must be removed, and delivered to the Contractor, shall be Subsidiary to other Items.
Drainage Blanket shall be paid for at Sq. Yds. of "Drainage Blanket" and includes all work and labor required to furnish and install the granular backfill and filter fabric as shown on the plans. Drainage Blanket shall conform to the requirements of the 2007 Edition of the Nebraska Standard Specifications for Highway Construction provisions of Section 914, Pipe Undrains, Type A-B-D (Drainage Blanket) with filter fabric on the NOR Approved Products List, selected to accommodate the type of in-situ soils and within the manufacturer's requirements and limits in accordance with 914.02-4., 5., and 6. The granular backfill and filter fabric shall be supplementary to the drainage blanket pay item.
NOTE:
Riprap above approximate ordinary high water elevation 1107.50 shall be covered by a minimum 6 inches of soil. Soil shall be compacted and seeded. This work shall be subsidiary to other bid items.
See Permit No. NW-2014-02516-W9
**DETAIL A**

* 36" DIA. X 3'-0" LONG GALVANIZED STEEL PIPE

**DETAIL B**

* 2" DIA. X 3'-0" LONG GALVANIZED STEEL PIPE

---

**PLAN VIEW**

ROUND CURVET PIPE

---

**ELEVATION**

ROUND CURVET PIPE

---

**END VIEW**

ROUND CURVET PIPE

---

**BAR PLATE DETAIL**

---

**CONCRETE ANCHOR INSERT DETAIL**

---

**QUANTITIES TABLE**

<table>
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<tr>
<th></th>
<th>CONCRETE</th>
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<td>(CU. YDS.)</td>
<td>(CU. YDS.)</td>
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<tr>
<td></td>
<td>(LBS.)</td>
<td>(LBS.)</td>
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<tr>
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</tr>
<tr>
<td>2'-0&quot;</td>
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<td>49</td>
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<tr>
<td>7'-6&quot;</td>
<td>1.7</td>
<td>118</td>
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**NOTES:**

1. ALL CONCRETE USED SHALL BE CLASS 478-3000 AND SHALL BE AID UNDER THE ITEM "CLASS 478-3000 CONCRETE FOR INLET AND JUNCTION BOX." THE MINIMUM COVERING, MEASURED FROM THE FACE OF THE CONCRETE TO THE SURFACE OF ANY REINFORCING BAR SHALL BE 2" UNLESS OTHERWISE NOTED.

2. ALL REINFORCING STEEL USED SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615. GRADE 60, SHALL BE NO. 4 BARS PLACED AT 1'-0" CENTERS MAXIMUM AND SHALL BE PAID FOR UNDER THE ITEM "REINFORCING STEEL FOR INLET AND JUNCTION BOX." FIELD BEND AND/OR CLIP REINFORCING STEEL TO MAINTAIN MINIMUM COVERING.

3. THE 2" DIA. X 2'-9" PIPE, TRASH BAR PLATES AND ALL ASSOCIATED HARDWARE SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A53.

4. ALL GALVANIZED STEEL PIPE, DIAGONAL BARS, PREPARATION, MATERIALS, SUPPLEMENT, TOOLS, LABOR, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK THAT IS NOT PAID FOR DIRECTLY, SHALL BE CONSIDERED SUBSIDIARY TO OTHER ITEMS FOR WHICH PAYMENT IS MADE.

5. NO ALLOWANCES HAVE BEEN MADE IN THE QUANTITIES FOR PIPE OPENINGS.

6. Gleys may enter the box on a skew, the outside horizontal diameter of the pipe must not exceed the inside width of the box and it must enter the box between the outside corners of the box.

7. Gleys pipe shown for orientation purposes only.
SILT CHECK: SLOPE, SPACING, AND DIAMETER

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<tr>
<th>S/I</th>
<th>Spacing</th>
<th>Diameter</th>
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<tbody>
<tr>
<td>LESS THAN 5%</td>
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<td>8</td>
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<tr>
<td>5% - 10%</td>
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<tr>
<td>11% - 30%</td>
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<td>31% - 60%</td>
<td>25</td>
<td>12</td>
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<tr>
<td>GREATER THAN 60%</td>
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<td>12</td>
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</table>

6'-0" maximum below top of slope
6'-0" maximum for 5% - 10% slope
5'-0" maximum for 11% - 60% slope
5'-0" maximum for greater than 60% slope

SILT STAKE DETAIL (WITH TRENCH)

Option A
SILT STAKE DETAIL (WITH TRENCH)

Option B
SILT STAKE DETAIL (WITH TRENCH)

Option C
SILT STAKE DETAIL (WITH TRENCH)

Option D
SILT STAKE DETAIL (NO TRENCH)

NOTES:
WASHING IS OPTIONAL FOR CHECKS ON BACKSLOPES & FACESLOPES.

SILT CHECKS ALL TYPES
SPECIAL PLAN 2C

SHEET 1 OF 4
When required a silt trap (ST) shall be excavated to the width of the ditch and no direct payment will be made.

SILT CHECK - SLASH MULCH
OPTION A

PLAN VIEW
FOR FLAT BOTTOM DITCH

CROSS SECTION
SILT CHECK - SLASH MULCH
OPTION A
SILT CHECK OUTLET PROTECTION

SILT CHECK INLET PROTECTION

SILT CHECK INLET FILTER

SILT CHECK TYPE 4
47 INLET

SILT CHECKS ALL TYPES
SHEET 4 OF 4

SPECIAL PLAN 2C
Addendum #1
December 4, 2017

Pflug Road – 228th Street to 230th Street, Project C-77 (15-14)
For the
Public Works Department

1. ACCEPTANCE OF BIDS:

The deadline for accepting Bids for this project is hereby amended from December 7th at 10:00 a.m. to December 14, 2017 at 10:00 a.m.

2. PRE-BID MEETING:
A Pre-Bid Meeting will be held December 7, 2017 at 8:00 a.m. on-site at 228th and Pflug Road. The Pre-Bid Meeting will provide opportunity for interested bidders to interact Sarpy County and the project engineering team. this will be the only time allowed on-site with Sarpy County and the project engineering team. The attendance at the Pre-Bid is optional and not a requirement for submitting a bid on this project.

3. QUESTIONS RECEIVED AND RESPONSES

Question 1: Under Compaction Requirements- ‘What is the proctor? Standard or modified?’


Question 2: “What is bedding?”, “Why no seep collars?”

Response: Bedding materials and requirements are referenced in the NDOT Standard Specification 2007 Edition, Section 700. Seep collars not deemed necessary as water is not to be impounded upstream, and roadway prism to use soil types noted on Sheet 2-N1.

Question 3: “At station 92 there is a 15’ cut + bedding “Probably needs couplers @ discharge”
Response: Assuming this question is regarding connection of drop pipe from the area inlet to the 72-inch culvert, the 72-inch culvert will have a tap/stubout where a connection band will be installed.

Question 4: On the plan view (top left corner) “Slot or notch?” On the end view (middle of the page and bottom) – “Side?”

Response: Unclear of the question intent, however, if this question is in regards to the steel pipe attachment to the area inlet, Detail A on Sheet 5 shows a slot in the area inlet. Special Plan 1C on sheet 5, shows top view, elevation (side with pipe), end view (sides without pipe).

Question 5: Under Notes-Suitable Grade material- “Soil report? What is wrong with excavated material? All sandy except CL.”

Response: Geotechnical Report is attached to this document. Existing soil is not cohesive.


Response: Drainage blanket outlets into rip rap above the above ordinary high water. In general, the drainage blanket would be brought up to grade with adjacent embankment. There may be some sloughing, but the benching is indicated to ‘lock’ the new embankment into existing soil mass. Pay quantity is identified as 3,840 Cubic Yards.

Question 7: “If water in this bank, 1:1 cut slope will be hard to hold.” 1133.8  1115.0 18.8 Ft high

Response: As noted on Sheet 2-N1, first note; Prior to bidding the project, each bidder shall visit the site and satisfy themselves of the surface & subsurface conditions. Each bidder shall also fully inform themselves as to the extent of the scope of work to be performed.

Question 8: “Discharge end of culvert 1113.5 2:1 rip rap slope to elev. 1102.55 Drop 10.95 Ft. 72” pipe discharge rip rap won’t hold soil cover won’t hold either. Will it undercut end of pipe?”

Response: Soil cover is requirement of USACE 404 permit above ordinary high water. Culvert and Dissipator Pool are designed to reduce downstream velocities.

All other terms and conditions remain unchanged. Addendum must be acknowledged on the Bid Form.
Sarpy County Engineer
Project No. 185017B
Sarpy County, Nebraska

Pflug Road

Geotechnical Report

March 10, 2017
Revised June 19, 2017
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LIST OF ACRONYMS AND ABBREVIATIONS

AOI  Area of Interest
ASTM  ASTM International (formerly American Society for Testing and Materials)
ATV  All-Terrain Vehicle
AWWA  American Water Works Association
CME  Central Mine Equipment Company
CMP  Corrugated Metal Pipe
CR  County Road
CSD  Conservation and Survey Division (CSD)
CU  Consolidated Undrained
ft  Feet, foot
HSA  Hollow Stem Auger
in  inches
klf  kips per linear foot
LL  Liquid Limit
NAD83  North American Datum, 1983 (horizontal)
NAVD88  North American Vertical Datum, 1988
NRCS  USDA, Natural Resources Conservation Service (NRCS)
PL  Plastic Limit
PI  Plasticity Index
pcf  pounds per cubic foot
psf  pounds per square foot
SCS  Soil Conservation Service
SPT  Standard Penetration Test
TW  Thin-Walled (Shelby) Tube
USCS  Unified Soil Classification System
USDA  United States Department of Agriculture
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BORING LOGS: B1 – B2

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APPENDIX C – GENERAL SOILS REFERENCE INFORMATION
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Test Hole 7-A-00
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G-079561
G-151367
G-114279
G-087787

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1. Introduction

1.1 Project Background

The Pflug Road site is located at latitude 41° 4’ 28” North and longitude 96° 16’ 30” West in Sarpy County, Nebraska between I-80 to the West and S. 228th Street to the East. The eroded stream is located on an unnamed intermittent tributary of Western Sarpy Ditch, which follows nearby I-80 and flows into the Platte River approximately 3 miles southwest of the site. The purpose of this geotechnical site investigation report is to characterize subsurface soils and provide recommendations for a long-term solution to the erosion problem on Pflug Road.

WSP | Parsons Brinckerhoff was contracted by Sarpy County, Nebraska in September 2014 for a discovery/reconnaissance survey of the project site located near 228th Street and Pflug Road. The site survey consisted of on-site observations and a desktop review of the existing road geometry, drainage structures, and review of the drainage channel erosive conditions up/downstream of Pflug Road. A geotechnical investigation was recommended in WSP | Parsons Brinckerhoff’s Pflug Road Site Review Report, which was prepared January 28, 2015 and revised on June 11, 2015. The scope of the current geotechnical evaluation was agreed upon by WSP | Parsons Brinckerhoff and the Sarpy County Board of County Commissioners for culvert replacement and stream restoration from severe erosion.

WSP | Parsons Brinckerhoff is providing professional engineering design services consisting of: environmental documentation and resource reviews/permitting; surveying; geotechnical evaluation, engineering design, and project management for the Board of County Commissioners, Sarpy County, NE.

1.2 Existing Conditions and Recent Interim Remedial Measures

Pflug Road is a rural gravel road. An unnamed tributary flows northwest and crosses Pflug Road in an existing corrugated metal pipe culvert (CMP). The site consists of a severely eroded channel north of Pflug Road with eroded depths approximately 30 to 40 feet and eroded channel widths of 100 to 150 feet. The erosion has been ongoing for some time, but in 2013 started to threaten the stability of Pflug Road. The adjacent land is gently rolling farmed fields with near vertical relief at the severe erosion channel North of Pflug Road. Emergency remedial measures to extend the drainage culvert and install short term erosion control was recommended by WSP | Parsons Brinckerhoff in the Pflug Site Review Report in 2014 and these emergency measures where implemented in 2015.
Figures 1 and 2 present 2013 and 2016 aerial views of the site. The erosion continued and in 2014, telephone poles began leaning and the northern road shoulder of Pflug Road began to drop off. WSP | Parsons Brinckerhoff performed a site assessment on September 14, 2014. Prior aerial photos from 2001, 2004, 2007, and 2010 are included in Appendix A of the Pflug Road Site Review Report revised June 11, 2015, and show a gradual progression of the erosion channel from the wooded area north of Pflug Road upstream towards Pflug Road. Such erosion, with the knickpoint (the location of an abrupt change in channel slope) progressing upstream over time, is characteristic of stream erosion in loess soils.

Figure 1: Pflug Road Site Vicinity Aerial (From 2013)
At the time of our geotechnical investigation, soil was stockpiled just east of the erosion channel by the landowner. The stockpiled material was not sampled, and WSP | Parsons Brinckerhoff does not know the source of the stockpiled material. From solely visual observation of the stockpile, it appears to be a mixture of topsoil and loess soil material.

Figure 3 shows a site photograph of the eroded channel and the stockpiled soil material. Figure 4 shows a site overview, extending west from the Pflug Road crossing, showing the eroded area in relationship to the road.

In June 2017, further erosion resulted in apparent ground movement and formation of a tension crack in the roadway, and the road was closed to traffic.
Figure 3: Site Photograph Looking East at erosion and stockpiled soil on May 4, 2016
1.3 Proposed Erosion Mitigation Measures

This geotechnical report has been prepared to provide design support for proposed erosion mitigation measures, which are anticipated to include:

- Installing a new CMP culvert on a revised alignment skew to Pflug Road, with energy dissipation and scour protection at the outlet;
- Measures to stabilize and/or restore portions of the eroded existing channel; and
- Erosion control measures for the realigned channel and roadway drainage ditches.
2. General Project Site Information

2.1 Regional Physiographic Divisions

Sarpy County is a broad loess-mantled upland till plain located between the valleys of the Missouri and Platte Rivers, which bound the county on three sides. As described by the Soil Survey of Sarpy County, Nebraska (1905) these streams have cut their channels from 100 to 300 feet below the former level of the glacial plain and have given rise to two distinct physiographic divisions – the highlands and lowlands. The project site is within the highlands physiographic division, with the lowlands located west of I-80.

The topography of the highlands presents a variety of surface features consisting of high, level plateaus, gentle slopes, and steep precipitous bluffs. The highest altitudes in the county range from 1,200 to 1,300 feet above sea level and are found in the western part of the county from 2 to 3 miles east of the Platte, where a narrow tableland, extending north and south, forms the drainage divide between the Platte and the Missouri river systems. The project site is within this tableland and drains towards the Platte River.

2.2 Site Quaternary Geology

Based upon interpretation of the Surficial Geologic Map of the Ashland East Quadrangle, Nebraska (Mason and Joeckel, 2001) and the Surficial Geologic Map of the Greater Omaha Area, Nebraska and Iowa (Shroba et al, 2001), the site is anticipated to primarily lie within Peoria Loess (Qlp), with alluvium (Qa) and slopewash sediment (Qsw) blanketing the loess along the margins of the channel.
The Peoria Loess is described by Shroba et al. (2002) as massive, calcareous or non-calcareous, pale yellow to light yellowish brown, wind deposited clayey silt (silt loam). Peoria Loess locally stands nearly vertically in road cuts and stream cuts, and locally it has columnar joints. The grain size distribution for 14 samples of Peoria Loess in and near Omaha average 7 percent sand (0.063 to 2 mm), 74 percent silt (0.004 to 0.063 mm) and 19 percent clay (<0.004 mm). Peoria Loess mantles extensive areas of older loess and pre Illinoian till (Oti) on valley sides and uplands, and it mantles late Wisconsin terrace alluvium in and near Omaha, Bellevue, and Springfield, Nebraska. Locally in eastern Nebraska and western Iowa, the lower part of the Peoria Loess has structures that may have been produced by solifluction, which is the slow movement of water-saturated soil overlying permafrost down a steep slope.

Regionally, thickness of the Peoria Loess ranges from 23 to 33 feet west of the flood plain of the Missouri River and north of the Platte River (Schroba et al, 2002). Older loess deposits,
variously described as the Gilman Canyon Formation, the Farmdale soil or the Pisgah unit underlie the Peoria loess, and are exposed only in section and not at the surface in the greater Omaha area.

Some or much of the Peoria Loess probably was deposited by westerly or northwesterly paleowinds (Schroba et al, 2002). The main sources of the Peoria Loess in the Greater Omaha area are the flood plains of the Missouri, Platte, and Elkhorn Rivers. Data from drill holes suggest that the flood plain of the Missouri River contributed more sediment than either the flood plain of the Platte River or the Elkhorn River. Other sources of Peoria Loess probably include silt derived from eroded White River Group sediments west of the map area. Peoria Loess is prone to slumping on steep slopes, and disturbed and sparsely vegetated areas are prone to gullying and sheet erosion.

### 2.3 Soil Survey of Sarpy County, Nebraska

The Soil Survey of Sarpy County, Nebraska was originally published by the United States Department of Agriculture (USDA) Soil Conservation Service in 1905. The current version of the soils survey is published and made digitally available online on the Web Soil Survey application provided by the USDA Natural Resources Conservation Service (NRCS). Review of the published Soil Survey provides a context for the general soil type and engineering properties of representative near surface soils.

A Custom Soil Resource Report for the specific area of interest (AOI) for the Pflug Road site was obtained online from the NRCS Web Soil Survey for this project on May 17, 2016. The Custom Soil Resource Report is provided in Appendix C. This AOI is used for general soils information and is not intended to coincide with the surveyed parcels. The Pflug Road site consist of Judson silty clay loam (7234) soils. Site soils mapped outside of the channel consist predominantly of Pohocco-Ida-Monona complex (8138) and Contrary-Monona-Ida complex (8157), both of which have parent materials consisting of loess. Judson silty clay loam, with a parent material of fine silty colluvium (presumably weathered from loess) is mapped within the intermittent stream channel. Figure 3 shows the mapped soil units and is taken from the NRCS Custom Soil Survey report.
Figure 6: NRCS Soil Survey Site Map
2.4 Bedrock Geology

The depth to bedrock at the project site is mapped at 100 foot intervals on the *Bedrock Geologic Map Showing Thicknesses of Overlying Quaternary Deposits, Fremont Quadrangle and Part of Omaha Quadrangle, Nebraska* (Burchett et al, 1975). At the site location the mapped depth to bedrock appear to be just slightly less than the 100 foot contour interval, with the 100 foot contour interval crossing Plug Road to both to the east and west of the existing unnamed intermittent stream crossing culvert, thus bedrock can be expected at a depth ranging from 50 to 100 feet.

Figure 7: Excerpt of Bedrock Geology Map (Burchett et al, 1975)

Bedrock at Pflug Road is mapped as sandstone and shale of the (Kd) Dakota Standstone formation of the Lower Cretaceous Series of the Cretaceous System (Burchett et al, 1975). This formation’s thickness ranges from 0 to 650 feet. The sandstone is described as white, light gray, brownish gray, yellow, reddish brown, red, very fine grained to coarse grained, friable, micaceous, and cross-bedded with local amounts of gravel, iron oxide or iron carbonate content from slight to moderate, siltstone, and ironstone zones. The shale is light gray, yellow, red, brown, mottled, dark gray, sandy carbonaceous and contains lenticular clay beds.
2.5 Readily Available Nearby Subsurface Data

2.5.1 Water Wells

Publically available water well installation records were reviewed using the Nebraska Department of Natural Resources online interactive water well map. Table 1 shows four nearby water well records and the recorded thickness of clay or loess, depth to sand layer, depth to static groundwater, depth to bedrock and type of bedrock.

<table>
<thead>
<tr>
<th>Well Registration No.</th>
<th>Thickness of Clay/Loess Deposit (ft)</th>
<th>Depth to Sand (feet)</th>
<th>Depth to Static Groundwater Level</th>
<th>Depth of Bedrock (ft)</th>
<th>Bedrock Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-079561</td>
<td>38</td>
<td>50</td>
<td>N/A</td>
<td>90</td>
<td>Fine – Medium Yellow Sandstone</td>
</tr>
<tr>
<td>G-114279</td>
<td>70</td>
<td>70</td>
<td>0</td>
<td>76</td>
<td>Gray Shale</td>
</tr>
<tr>
<td>G-151307</td>
<td>88</td>
<td>88</td>
<td>106</td>
<td>93</td>
<td>Gray Shale</td>
</tr>
<tr>
<td>G-087787</td>
<td>44.3</td>
<td>67.2</td>
<td>73.6</td>
<td>96.1</td>
<td>Brown and Gray Shale</td>
</tr>
</tbody>
</table>


2.5.2 Test Holes

The University of Nebraska maintains the Nebraska statewide test-hole database, which contains information for about 5,500 test holes drilled since 1930 by the Conservation and Survey Division (CSD), School of Natural Resources (SNR), University of Nebraska, and cooperating agencies. Two test holes are available from a site approximately 0.8 miles east-southeast of the project site. The records of these test holes are presented in Appendix D. Test hole 8-A-00 terminated in silt at a depth of 37 feet. Test hole 7-A-00 encountered silt to a depth of 57 feet, underlay by clay described as possible till to 67 feet, underlain by clayey and sandy till to 122 feet, underlain by medium to coarse grained sand to the termination depth of 157 feet. The test hole sites were located at a higher elevation of 1265 to 1275 feet, as compared to the project site with an approximate ground surface elevation of 1135 feet.
3. Geotechnical Investigation

3.1 Soil Boring Program

A total of two (2) geotechnical test borings were drilled for the project in the vicinity planned culvert extension. Boring locations are shown on the Boring Location Plan in Appendix A.

Drilling services were provided by Terracon, under subcontract to WSP | Parsons Brinckerhoff. A WSP | Parsons Brinckerhoff geotechnical engineer was onsite full-time to oversee drilling operations and to visually classify and log soil samples. The two test borings were drilled on May 4, 2016, and Figure 8 shows the site conditions on the day of drilling. Borehole B1 extended to a depth of 30 feet below the existing ground surface and borehole B2 was drilled to the apparent top of bedrock at a depth of 72.5 feet below the ground surface. Individual boring logs are provided in Appendix A.

Figure 8: Site Photograph
Looking Northwest at Drill Rig Set up at B-2 Location on May 4, 2016
The borings were advanced using a CME 550X rubber tire ATV drill rig utilizing 3-¼ in. hollow stem augers (HSA) and mud rotary techniques. The soil borings included Standard Penetration Test (SPT) sampling in accordance with ASTM D 1586 below the advancement depth of the auger. The SPT sampling was conducted by driving a 2.0-in O.D. split spoon sampler a distance of 18 inches with an automatic hammer. The number of hammer blows that was required to advance the sampler in 6-inch increments was recorded to obtain the SPT N-Value. The sampling was conducted at 2.5-foot intervals to a depth of 10 feet and at 5-foot intervals thereafter until reaching the boring termination limits. SPT samples were double bagged with Terracon retaining the primary samples and WSP | Parsons Brinckerhoff retaining the secondary samples. A total of four (5) thin-walled (TW) Shelby tubes were advanced, to obtain representative cohesive soil samples for strength testing and index testing. Pocket (hand) penetrometer measurements were also taken on cohesive soil samples while logging soils in the field to estimate cohesive soils strength and consistency.

The soil borings performed at this site are summarized in Table 2, and the individual boring logs are provided in Appendix A. Boring elevations were surveyed by RW Engineering and Surveying on May 4, 2016. Horizontal datum is Nebraska State Plane / NAD83, and the vertical datum is NAVD88.

<table>
<thead>
<tr>
<th>Boring Number</th>
<th>Coordinates</th>
<th>Approximate Elevation (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Northing</td>
<td>Easting</td>
</tr>
<tr>
<td>B1</td>
<td>474,088.5</td>
<td>2,666,933.5</td>
</tr>
<tr>
<td>B2</td>
<td>474,174.1</td>
<td>2,666,691.5</td>
</tr>
</tbody>
</table>
4. Laboratory Testing

Following completion of field drilling activities on May 4, 2016, primary soil samples were retained by Terracon and transported to their soils laboratory in Omaha, Nebraska for further classification and testing. Secondary soil samples were retained by WSP | Parsons Brinckerhoff and transported to our Indianapolis office for reference when assigning laboratory testing.

The laboratory testing program was developed by WSP | Parsons Brinckerhoff for the soil samples retrieved from the borings in order to verify field visual classifications and to further determine the composition and engineering properties for use in geotechnical analyses. A limited number of soil samples (25) collected from SPT split spoons and thin-walled Shelby tubes were selected for laboratory testing.

The laboratory tests were assigned by WSP | Parsons Brinckerhoff and performed by Terracon. The quantities and types of tests performed on representative soil samples from the test borings are summarized in Table 5. Detailed laboratory test results are attached in Appendix B.

Table 3: Summary of Laboratory Testing Program

<table>
<thead>
<tr>
<th>Test Performed</th>
<th>Number of Tests</th>
<th>Standard Test Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve analysis, with hydrometer</td>
<td>6</td>
<td>ASTM D421 / D422 / D1140</td>
</tr>
<tr>
<td>Atterberg Limits</td>
<td>6</td>
<td>ASTM D4318</td>
</tr>
<tr>
<td>Moisture content of soils</td>
<td>24</td>
<td>ASTM D2216</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>4</td>
<td>ASTM D7263</td>
</tr>
<tr>
<td>Unconfined compressive strength</td>
<td>3</td>
<td>ASTM D2166</td>
</tr>
<tr>
<td>Corrosion</td>
<td>1</td>
<td>AWWA 4500 H / AWWA 2580 / ASTM D 516 / AWWA 4500-D D / AWWA 2510 / ASTM D512 / ASTM G57</td>
</tr>
<tr>
<td>CU Triaxial</td>
<td>1</td>
<td>ASTM D4767</td>
</tr>
</tbody>
</table>
5. Subsurface Conditions

The soils were visually classified in the field by a WSP | Parsons Brinckerhoff geotechnical engineer in general accordance to the Unified Soil Classification System (USCS). Minor modifications to the USCS classifications were made according to WSP | Parsons Brinckerhoff Soil Classification Notes included in Appendix A. The USCS symbol is provided on the boring logs, based on the laboratory test results of representative visually classified soils samples. The general profile of the boreholes at the site consists of topsoil underlain by loess soils deposits to a depth of 36 feet (El. 1100), underlain glacial till to a depth of 53.5 feet (El 1082.8), underlain by alluvial deposits to a depth of 68.5 feet (El 1067.8), underlain by residual clay to the apparent top of bedrock at a depth of 72.5 feet (El. 1063.8).

5.1 Loess

The test borings indicate that underlying the topsoil, loess soil deposits consist of brown and gray CL soils and orange and reddish brown ML soils according to the USCS. The loess soils are further described on the logs as brown to dark brown CLAY & SILT, SILT & CLAY, and orange and reddish brown SILT. These soils are medium stiff to very soft in consistency, moist to wet, and ranged from non-plastic to medium plasticity. The moisture contents ranged from 20 to 31. The SPT N-values for these soils ranged from weight of hammer (0) to 7 blows per foot. Pocket (hand) penetrometer (QP) tests performed on this soil in the field estimated unconfined compressive strength to range from less than 500 psf (0.25 tsf) to as 3,000 psf (1.5 tsf). Laboratory strength testing consisting of unconfined compressive strength (Quc) tests and consolidated undrained (CU) triaxial testing was performed on representative Shelby tube soil samples. Four (4) unconfined compressive strength (Quc) tests were performed and ranged from 430 psf (0.21 tsf) to 1080 psf (0.54 tsf). Effective stress parameters from CU triaxial testing found an effective cohesion (c') of 216 psf (0.108 tsf) with an effective friction angle of 29.7 degrees. Total stress parameters from CU triaxial testing found a total cohesion (c) of 360 psf (0.18 tsf) with a total friction angle of 14.4 degrees. Atterberg Limits tests were performed on four (4) loess soil samples. The ML soil was non plastic, and the liquid Limits (LL) of the CL soils ranged from 43 to 44 percent with the Plasticity Index (PI) from 8 to 15 percent.

5.2 Glacial Till

Below the loess soil deposit, glacial till soil was encountered from a depth of 36 to 53.5 feet (El 1100 to El 1082.8). The glacial till classified as CL and was further described as dark gray to black Silty CLAY, trace sand, high plasticity, stiff to hard, and dry to damp. The moisture content of this layer ranged from 21 to 30 percent. The SPT N-values for these soils ranged from 13 to 39 blows per foot. Pocket (hand) penetrometer (QP) tests performed on this soil in the field
estimated unconfined compressive strength as 9,000 psf (4.5 tsf). Atterberg Limits tests were performed on two glacial till soil samples. Liquid Limits (LL) ranged from 31 to 37 percent, and the Plasticity Index (PI) from 23 to 27 percent.

5.3 **Alluvial**

Below the glacial till, alluvial soils were encountered to a depth of 68.5 feet (El. 1167.8). The alluvial soils were visually classified as SM and described on the boring logs as light brown to white, fine SAND, and SILT, extremely dense, and wet. SPT N-values ranged from 50 blows over 5 inches to 50 blows over 2 inches.

5.4 **Residual Clay**

Below the alluvial soils, residual clay soil was encountered to the apparent top of bedrock at a depth of 72.5 feet (El. 1063.8). The residual clay soil was visually classified as CL and described as orange to orangeish brown Silty CLAY, and Sand, trace gravel, and hard. The SPT N-value was 66 blows per foot and the pocket (hand) penetrometer ($Q_p$) tests estimated unconfined compressive strength as 9000 psf (4.5 tsf).

5.5 **Groundwater**

Groundwater observations were made during the drilling operations by noting the depth of free water on the drilling tools, and also at the end of drilling using a tape measure. The groundwater was encountered at depths ranging from 18 to 19 feet below the ground surface (El. 1117.3 to 1119.8) at the time of drilling on May 4, 2016.

Groundwater should be expected to vary based on seasonal climatic conditions. Perched groundwater may occur however, no perched water was observed in the borings.

Seepage was observed along the slope of the eroded channel. Seepage locations were not surveyed but appeared to generally coincide with the observed groundwater in boring B-2 at approximately El. 1120 ft.

5.6 **Bedrock**

Boring B2 was terminated at the apparent top of bedrock at a depth of 72.5 feet (El. 1063.8) Based on mapped information, bedrock was expected to be at a depth of slightly less than 100 feet below the existing ground surface at the project site.
6. Design Recommendations and Construction Considerations

6.1 Cause(s) of Erosion Conditions and Recommended Mitigation

The onsite loess soil is inherently susceptible to severe erosion. Loess soils is was deposited by the wind, and thus soils has a very uniform grain size distributions of more than 70 percent silt size particles. These flour sized soil particles (loess silt) are highly erodible because they can be easily transported by flowing water.

At the Pflug site the initial, the knickpoint in the deep erosion channel had been progressing upstream (to the southeast) for some time prior to 2013. Overland and shallow concentrated flow across the existing farm field to the newly created unnamed tributary’s eroded channel now appears to be causing secondary erosion and the formation of additional knickpoints.

From our geotechnical field observations at the time of drilling and review of aerial photography from recent years, erosion knickpoints at locations of shallow concentrated flow from the existing field and roadside ditches. Thus the exposed loess slope are eroding due to both channel flow from the culvert and shallow concentrated surficial flow. Erosion is likely to occur in the spring or other periods of heavy rainfall. It appears that the hydraulic channel improvements from the 2015 emergency project has provided protection against slope erosion from Pflug Road directly adjacent to the culvert. However, surficial shallow concentrated flow into the existing channel is causing ongoing slope erosion and instability in the loess soils.

Because of the loess soil in this region, a larger stream restoration design may be warranted for the overall channel. However, the focus of this geotechnical report is solely on the creating a long-term remediation for the Pflug Road Culvert and the existing channel side slopes in the immediate area of the roadway, for protection of Pflug Road.

6.2 Recommended Mitigation

Regrading is recommended to establish stable slopes. Sloughed material should be removed during regrading, and any replacement fill required to establish final slopes should be imported embankment fill. Excavated sloughed materials are not expected to be suitable for placement as embankment fill. Slope protection and slope drains are recommended to limit the alluvial erosion of the channel slopes. Overland flow should be captured in drainage channels and directed into the channel by means of slope drains.

Currently, the west side of the channel in the eroded area north of Pflug Road has overall average slopes of about 1.5H:1V, although portions of the slopes are locally steeper than 1H:1V (horizontal to vertical). Stability analyses were performed for selected cross sections of the west slope in the area of the road, based on stratigraphy, soil properties, and groundwater conditions evaluated based on the soil borings. Results of stability analyses performed for the
For the sections adjacent to Pflug Road, the factor of safety was found to exceed 1.5, which is considered acceptable. However, these loess slopes may fail locally from alluvial erosion and the subsequent wetting and drying cycles. To reduce the risk of local failures, we recommend that the locally steep areas of the west slope be cut to 1.5H:1V within 200 feet of Pflug Road. Erosion control materials should then be placed on the regraded slopes. Erosion control mats and slope vegetation should be placed along the regraded slopes to protect against alluvial erosion.

The stockpiled material north of the channel results in a marginally stable condition, with a calculated factor of safety just over 1.0 in the long term (effective stress) condition. The surcharge should be removed to a distance at least 15 feet from the crest of the channel slope, which will improve the stability to provide a calculated factor of safety of 1.2, which is lower than the factor of safety of 1.3 typically recommended for slopes not involving structures, for roadway projects per AASHTO. If practical given property ownership considerations, in addition to removing the surcharge, the slope should also be regraded to 1H:1V, and erosion control provided by means of erosion control mats and slope vegetation.

Along Pflug Road, where the loess soils have failed and sloughed into the channel, and under the roadway in the area north of the tension crack which formed in June 2017, the disturbed and sloughed materials need to be fully removed to establish stable slopes. Along the west side of the channel, the removal should extend approximately 200 ft west of Pflug Road. Along Pflug Road, removal should extend at least 5 feet beyond the east-west limits of the tension crack. Stability analyses are based on the strength properties of undisturbed soils and are not applicable to disturbed, sloughed materials. Sloughed soils should be completely excavated, with benching, to expose undisturbed soils. Bench heights and widths should be not more than 3 feet, with an average slope along the bench cut not steeper than 1H:1V. If sloughed materials are left in place, such materials could create a plane of weakness and lead to stability issues.

Embarkment fill which replaces the excavated sloughed material must not impede groundwater seepage from the loess soils to the embankment face. Two alternatives can be considered: the embankment fill may be granular fill, with a gradation that results in a material more permeable than the native loess; or a minimum 18-inch wide chimney drain may be constructed of drainage fill consisting of open-graded gravel, between the unexcavated, undisturbed native soils and the embankment fill, which may be suitable cohesive fill (CL). A geotextile filter fabric should be provided above and below the drainage fill to prevent siltation and clogging of the drainage fill.
6.3 Culvert Bedding and Backfill and Energy Dissipation Basin

The culvert should be installed on suitable bedding material placed on undisturbed natural soil. Bedding and backfill provisions should be in accordance with typical NDOR practice.

At the outlet of the drainage structure, an energy dissipation basin is required to reduce the risk of additional scour. A riprap basin is planned. Because the potential for alluvial erosion, the riprap should not be placed on the erosion susceptible loess soils. The excavation for the riprap for the energy dissipation basin should extend to the glacial till soils, over the entire footprint of the energy dissipation basin. Glacial till soils are expected at depth 36 feet (approximately El 1100 ft) based on test boring B2. Riprap should be installed on a filter fabric placed on undisturbed native soil.

6.4 Construction Considerations

6.4.1 General

During construction, the contractor should take care to protect slopes from further degradation and erosion. Earthwork should not be performed during wet weather because the loess soils consist of highly erodible silt particles. The recommendations of this report assume that soils have not been degraded.

During channel erosion mitigation construction, erosion and sediment control best practices as outlined in the Nebraska Department of Road’s Construction Stormwater: Best Practices pocket handbook should be utilized. Construction planning will need to consider means of access for equipment, workers, and materials within the channel. Temporary cuts required for access should be protected against erosion during the construction period. The trafficability of the loess soils will be poor during periods for wet weather. Also, the glacial till is cohesive and is readily disturbed by traffic of workers and equipment in the presence of water. Concrete should be placed on the day excavations are completed, or the surface should be protected with a lean concrete mud mat.

6.4.2 Slopes

Soil berms, diversions, and hydraulically applied mulches should be constructed and applied daily as a temporary measure to any excavated channel slopes that have not been fully reconstructed with filter fabric and rip rap slope protection.
Temporary slope drains should be installed to minimize further erosion during construction. Figure 9 is an example of a slope drain taken from the Nebraska Department of Road’s Construction Stormwater: Best Practices pocket handbook.

Figure 9: Example of Slope Drain

Silt fence and compost logs shall be placed at the edge of the eroded channel to minimize further erosion during construction.
6.5 Closing

The onsite loess soils have a high potential for erosion. The recommendations of this report are intended to address erosion risk in the immediate area of Pflug Road. However, future erosion risk in the area of the road may be influenced by unmitigated downstream conditions.

For many complex sites such as this Pflug Road site, geotechnical engineering involvement should continue through final design and construction. The geotechnical engineer should have the opportunity to review final project plans and the geotechnical engineer should be consulted during construction if site subsurface soil conditions appear to be different than described in this report.
7. References


Nebraska Statewide Test-hole Database. Available online at http://snr.unl.edu/data/geologysoils/NebraskaTestHole/NebraskaTestHoleIntro.asp Accessed [May 17, 2016].

Appendix A – GEOTECHNICAL INVESTIGATION

FIGURE 1 – BORING LOCATION PLAN
FIGURE 2 – WSP | PARSONS BRINCKERHOFF SOIL CLASSIFICATION SYSTEM
BORING LOGS: B1 – B2
SUMMARY OF PARSONS BRINCKERHOFF SOIL CLASSIFICATION SYSTEM

DESCRIPTION OF PRINCIPAL AND OTHER COMPONENTS

PRINCIPAL COMPONENT: GRAVEL, SAND, SILT

OTHER COMPONENT: Gravel, Sand, Silt, Clay

PARTICLE SIZE DEFINITIONS

SOIL SIZING FRACTION  SIEVE NUMBER AND SIZE

Boulders >12 in (<305 mm)
Cobbles 12 in. – 8 in. (305 mm to 75 mm)
Gravel COARSE 3 to 5/4 in. (75 mm to 19 mm)
     FINE 3/4 in. to No. 4 (19 mm to 4.75 mm)
Sand COARSE No. 4 to No. 10 (4.75 mm to 2.00 mm)
     MEDIUM No. 10 to No. 40 (2.00 mm to 0.425 mm)
     FINE No. 40 to No. 200 (0.425 mm to 0.075 mm)
Silt < No. 200 (0.075 mm)
Clay < No. 200 (0.025 mm)

GRANULAR SOILS

DENSITY/COMPACTNESS

DESCRIPTION  SPT N-VALUE

Very loose 0-4
Loose 5-9
Medium dense 10-20
Dense 20-40
Very dense 50-80
Extremely dense >80

CLAY SOILS

OVERALL PLASTICITY INDEX

SLIGHT PL 1-3
LOW PL 4-10
MEDIUM PL 11-20
HIGH PL 21-40
VERY HIGH PL >40

PLASTICITY INDEX

SILT CONTENT (vol%)

VERY SOFT <2
SOFT 2-4
MEDIUM STIFF 4-8
STIFF 8-15
VERY STIFF 15-30
HARD >30

SENSITIVE DENSITY

<0.35 <100
0.35-0.50 25-50
0.50-1.0 50-100
1.0-2.0 100-200
2.0-4.0 200-400
>4.0 400-

CHARACTERISTICS

EXTRACTED BETWEEN FINGERS WHEN SQUEEZED
CAN BE PINCHED IN TWO BETWEEN THUMB AND FOREFINGER
CAN BE IMPERFECT EASILY WITH FINGERS
REMOVED BY LIGHT FINGER PRESSURE
CAN BE IMPERFECTED CONSIDERABLE FINGER PRESSURE, OR IMPACTED WITH TRENCH HAMMER
CAN EASILY BE IMPERFECTED BY FINGER PRESSURE, OR IMPACTED WITH TRENCH HAMMER
CANNOT BE IMPERFECTED BY HAND, OR DIFFICULT TO IMPACT WITH TRENCH HAMMER

Notes:
1. Each soil sample is classified individually on the boring log. When the classification of a soil sample is the same as the sample shown, it is designated “same as sample” on the boring log. When the classification is the same as the sample shown except for either mineral such as a change in the density or percentage of a minor component, only the variation shown is added, e.g., “same, same gravel.”
2. When the soil stratigraphy varies within a split sample, each portion is isolated from each other (i.e., top, bottom, middle) and logged separately.
3. Consistency of fine-grained materials is determined based on unconfined compressive strength and laboratory tests or field performance records (p (when available) and SPT (when available). When both are used, the lower value should be used.
4. Split samples designated with the symbol * refer to selected samples obtained with a 3.5-in. 0 split sample. The SPT N values range from 50 to 80.
### Boring Log

**Project:** Plug Road, Sarpy Co., NE  
**Location:** Sarpy Co., NE  
**Client:** Sarpy County  
**Contractor:** Terracon  
**Driller:** R. Peterson  
**Inspector:** S. Valavala  
**Drilling Method:** 3.25-inch (I.D.) Hollow Stem Augers  
**Rig Type:** CME-550 ATV

---

#### Boring Log Details

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>SOIL (Blows/6 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>REC. (in.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type/Symbol</th>
<th>Casing</th>
<th>Split Spoon</th>
<th>Shelby Tube</th>
<th>Piston</th>
<th>Grab</th>
<th>Core Barrel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
<td>U</td>
<td>P</td>
<td>G</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>I.D.</td>
<td>1.375&quot;</td>
<td>2.938&quot;</td>
<td></td>
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</tr>
<tr>
<td>O.D.</td>
<td>2&quot;</td>
<td>3&quot;</td>
<td></td>
<td></td>
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<tr>
<td>Length</td>
<td>18&quot;</td>
<td>24&quot;</td>
<td></td>
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</tr>
<tr>
<td>Hammer Wt.</td>
<td>Automatic Hammer</td>
<td></td>
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<tr>
<td>Hammer Fall</td>
<td>Drill Rod Size</td>
<td></td>
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---

#### Graphical Log

<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>GRAPHIC LOG</th>
<th>CASING NUMBER</th>
<th>SYMBOL</th>
<th>DEPTH (feet)</th>
<th>SAMPLE</th>
<th>SOIL (Blows/6 in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>REC. (in.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TOPSOIL (4-inches)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Soft to medium stiff, No roots, ( q_p = 1.0 ) tsf, water content 23%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>( q_p = 1.0 ) tsf (LL=33, PL=23, PI=10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>( q_p = 0.5 ) tsf, water content 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>( q_p = 0.5 ) tsf, water content 29%</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>( q_p = 0.25 ) tsf, water content 32%</td>
</tr>
</tbody>
</table>

---

#### Field Classification and Remarks

- **Depth:** (ft)
- **Elev.:** (ft)
- **Description:**
  - **TOPSOIL (4-inches):** Brown to dark brown SILT & CLAY, trace Sand, trace Roots, low plasticity, soft to medium stiff, moist, (CL), (Loess), \( q_p = 0.75 \) tsf, water content 26%
  - **Soft to medium stiff, No roots:** \( q_p = 1.0 \) tsf, water content 23%
  - **\( q_p = 1.0 \) tsf (LL=33, PL=23, PI=10)**
  - **\( q_p = 0.5 \) tsf, water content 25%**
  - **\( q_p = 0.5 \) tsf, water content 29%**
  - **\( q_p = 0.25 \) tsf, water content 32%**

---

**Boring No.:** B1  
**Sheet:** 1 of 2
**BORING LOG** (continued)

**PROJECT:** Pflug Road Sarpy Co., NE  
**LOCATION:** Sarpy Co., NE  
**CLIENT:** Sarpy County  
**CONTRACTOR:** Terracon  
**DRiller:** R. Peterson  
**INSPECTOR:** S. Valavala

**FIELD CLASSIFICATION AND REMARKS**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample</th>
<th>Soil (Blows/ft)</th>
<th>Rec. (in.)</th>
<th>Rec. %</th>
<th>L&gt;4&quot; (in.)</th>
<th>RQD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.5</td>
<td>S 6</td>
<td>18.5 - 20.0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brown to dark brown SILT &amp; CLAY, trace Sand, low plasticity, soft to medium stiff, moist, (CL), (Loess), $Q_p = 0.25$ tsf, water content 32%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.5</td>
<td>S 7</td>
<td>23.5 - 25.0</td>
<td>WOH</td>
<td>WOH</td>
<td>WOH</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light brown and gray SILT &amp; CLAY, low plasticity, soft to medium stiff, wet, (CL), (Loess), $Q_p = 0.25$ tsf, water content 27%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.5</td>
<td>S 8</td>
<td>28.5 - 30.0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$Q_p &lt; 0.25$ tsf, water content 31%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>End of boring at 30 feet. Borehole tremie grouted with cement-bentonite mix upon completion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOCIAL CLASSIFICATION AND REMARKS**

- **Depth (ft):**
- **Sample:**
- **Soil (Blows/ft):**
- **Rec. (in.):**
- **Rec. %:**
- **L>4" (in.):**
- **RQD %:**

**Elev. (ft):**

- **1119.3**
- **1107.8**

**Boring No.** B1  
**Sheet** 2  
**of** 2
**BORING LOG**

**PROJECT:** Pflug Road Sarpy Co., NE  
**LOCATION:** Sarpy Co., NE  
**CLIENT:** Sarpy County  
**CONTRACTOR:** Terracon

**DRILLER:** R. Peterson  
**INSPECTOR:** S. Valavala

**DRILLING METHOD:** 3.25-inch (I.D.) Hollow Stem Augers / Mud Rotary  
**RIG TYPE:** CME-550 ATV

**GROUNDWATER DATA**

<table>
<thead>
<tr>
<th>Type/Symbol</th>
<th>Date</th>
<th>Time</th>
<th>Water Depth (ft)</th>
<th>Casing Depth (ft)</th>
<th>Hole Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>05/04/16</td>
<td>12:50 pm</td>
<td>19.0</td>
<td>18.0</td>
<td>19.5</td>
</tr>
<tr>
<td>U</td>
<td>05/04/16</td>
<td>4:40 pm</td>
<td>-</td>
<td>-</td>
<td>31.0</td>
</tr>
</tbody>
</table>

**FIELD CLASSIFICATION AND REMARKS**

- **Depth (ft):** 0.4  
  **Elev. (ft):** 1135.9

- **TOPOIL (5-inches):** Brown to dark brown CLAY & SILT, trace Roots, medium plasticity, medium stiff, moist, (CL), (Loess), \( Q_p = 1.5 \) tsf, water content 23%

- **No roots, \( Q_u = 1.0 \) tsf, water content 25%**

- **\( Q_p = 1.5 \) tsf, water content 20%**

- **\( Q_p = 0.54 \) tsf (LL=37, PL=22, PI=15) (\( \gamma_d = 83 \) pcf), water content 22%**

- **\( Q_p = 2.5 \) tsf, water content 22%**

- **\( Q_p = 0.5 \) tsf, water content 22%**
<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>GRAPHIC LOG</th>
<th>SAMPLE</th>
<th>SOIL (Blows/6 in.)</th>
</tr>
</thead>
</table>
|              |             |        | 0/6  | 6/12 | 12/18 | 18/24 | REC. | REC. | L>4" | RQD |%
|              |             |        | L>4" | L>4" | L>4" | L>4" | L>4" | L>4" | L>4" | L>4" | L>4" |
| 18.0 - 19.5  | S 6         | WOH    | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  |
| 23.5 - 25.0  | S 7         | WOH    | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  |
| 26.0 - 28.0  | U 3         |        |      |      |      |      |      |      |      |      |      |
| 28.0 - 29.5  | S 8         | WOH    | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  | WOH  |
| 33.0 - 35.0  | U 4         |        |      |      |      |      |      |      |      |      |      |

FIELD CLASSIFICATION AND REMARKS

- **Brown to dark brown CLAY & SILT, medium plasticity, medium stiff, moist, (CL), (Loess)**
  - \(q_u = 0.21\) tsf \((\gamma_d = 86\) pcf), water content 31%
  - Elev. \(1118.3\) ft

- **Gray and light brown SILT & CLAY, low plasticity, very soft, wet, (CL), (Loess), \(q_u < 0.25\) tsf, water content 29%**
  - Elev. \(1118.3\) ft

- **Orange and reddish brown SILT, trace Clay, trace Sand, non plastic, very loose, wet, (ML), (Loess), \(q_u = 0.28\) tsf \((\gamma_d = 89\) pcf), water content 31%**
  - Elev. \(1100.3\) ft
<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>SAMPLE</th>
<th>SOIL (Blows/6 in.)</th>
<th>FIELD CLASSIFICATION AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0/6</td>
<td>6/12</td>
</tr>
<tr>
<td>38.5 - 40.0</td>
<td>S 9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>43.5 - 45.0</td>
<td>S 10</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>48.5 - 50.0</td>
<td>S 11</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>53.5 - 53.9</td>
<td>S 12</td>
<td>50/5</td>
<td>3</td>
</tr>
</tbody>
</table>

**PROJECT:** Pflug Road Sarpy Co., NE  
**LOCATION:** Sarpy Co., NE  
**CLIENT:** Sarpy County

(Begin mud rotary drilling at 36.5 ft)

Dark gray to black Silty CLAY, trace Sand, high plasticity, stiff, dry to damp, (CL), (Glacial Till), $Q_p = 4.5$ tsf, water content 30%

Very stiff, $Q_p = 4.5$ tsf, water content 28%  
(LL=43, PL=20, PI=23)

Hard, $Q_p = 4.5$ tsf, water content 21%  
(LL=44, PL=17, PI=27)

Light brown to white fine angular to subangular SÅND and SILT, extremely dense, wet, ($SM$)  
(Driller's note: mud rotary advanced at the lowest possible drill rig pressure (150 psi), material not rock)
<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>GRAPHIC LOG</th>
<th>SAMPLE</th>
<th>SOIL (Blows/6 in.)</th>
<th>FIELD CLASSIFICATION AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (ft)</td>
<td>Elev. (ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/2</td>
<td>68.5 - 58.7</td>
<td>S 13</td>
<td>0</td>
<td>Light brown to white fine SAND and SILT, extremely dense, wet, (SM)</td>
</tr>
<tr>
<td>50/3</td>
<td>63.5 - 63.8</td>
<td>S 14</td>
<td>2</td>
<td>Same as above</td>
</tr>
<tr>
<td>50/0</td>
<td>72.5 - 72.5</td>
<td>S 15</td>
<td>18</td>
<td>Orange to orangeish brown Silty CLAY and Sand, trace Gravel, hard, (CL), (Residual clay), Q_p = 4.5 tsf, water content 20%</td>
</tr>
<tr>
<td>0</td>
<td>72.5</td>
<td>S 16</td>
<td>0</td>
<td>End of boring at 72.5 feet. Borehole tremie grouted with cement-bentonite mix upon completion.</td>
</tr>
</tbody>
</table>
APPENDIX B – GEOTECHNICAL INVESTIGATION
LABORATORY TEST DATA
**PROJECT INFORMATION**

**PROJECT:** PFLUG ROAD CULVERT

**LOCATION:** SARPY COUNTY, NE

**DATE:** 5/20/2016

**CLIENT:** PARSONS BRINCKERHOFF, INC.

**PROJECT NO:** D9165011

**TYPE OF TEST & NO:** CU Triaxial - CU-1

**SAMPLE TYPE:** SHELBY TUBE

**DESCRIPTION:** LEAN CLAY (CL), Light Olive Brown

**SAMPLE LOCATION:** B-2, U3, 26.0' - 28.0'

**ASSUMED SPECIFIC GRAVITY:** 2.70

**LL:** 31  
**PL:** 23  
**PI:** 8  
**Percent -200:** 95

**REMARKS:**

---

**GREGORY GEOTECHNICAL SOFTWARE**

**EFFECTIVE STRESS PARAMETERS**

<table>
<thead>
<tr>
<th>SPECIMEN NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Content - %</td>
<td>30.3</td>
<td>31.2</td>
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<tr>
<td>Dry Density - pcf</td>
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<td>87.3</td>
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</tr>
<tr>
<td>Diameter - inches</td>
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<td>1.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height - inches</td>
<td>3.22</td>
<td>3.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AT TEST</strong></td>
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<td></td>
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</tr>
<tr>
<td>Final Moisture - %</td>
<td>26.5</td>
<td>26.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density - pcf</td>
<td>94.7</td>
<td>92.2</td>
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</tr>
<tr>
<td>Calculated Diameter (in.)</td>
<td>1.39</td>
<td>1.40</td>
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<td></td>
</tr>
<tr>
<td>Height - inches</td>
<td>3.21</td>
<td>2.99</td>
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</tr>
<tr>
<td>Effect. Cell Pressure - psi</td>
<td>11.0</td>
<td>21.0</td>
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<td></td>
</tr>
<tr>
<td>Failure Stress - psi</td>
<td>13.65</td>
<td>20.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Pore Pressure - psi</td>
<td>106.7</td>
<td>113.4</td>
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</tr>
<tr>
<td>Strain Rate - inches/min.</td>
<td>0.00161</td>
<td>0.00151</td>
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</tr>
<tr>
<td>Failure Strain - %</td>
<td>4.4</td>
<td>6.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\sigma'_{1}$ Failure - psi</td>
<td>17.94</td>
<td>27.91</td>
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<tr>
<td>$\sigma'_{2}$ Failure - psi</td>
<td>4.29</td>
<td>7.65</td>
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---

**TEST DESCRIPTION**

**ASSUMED SPECIFIC GRAVITY:** 2.70

**LL:** 31  
**PL:** 23  
**PI:** 8  
**Percent -200:** 95

**REMARKS:**

---

**D9165011 CU B-2, U3, 26.0' - 28.0' 5-20-16.xls**
R^2 = 1.000  \quad \alpha (\text{deg}) = 26.4  \quad a (\text{psi}) = 1.3

PROJECT: PFLUG ROAD CULVERT

TYPE OF TEST & NO: CU Triaxial - CU-1

PROJECT NO: D9165011

DESCRIPTION: LEAN CLAY (CL), Light Olive Brown

EFFECTIVE STRESS PARAMETERS

\begin{align*}
\text{SPECIMEN NO. 1} & \quad \text{SPECIMEN NO. 2} \\
\text{SPECIMEN NO. 3} & \quad \text{SPECIMEN NO. 4}
\end{align*}

\begin{align*}
\text{p - q DIAGRAM} & \\
\text{q - psi} & \quad \text{p' - psi}
\end{align*}

D9165011 CU B-2, U3, 26.0'-28.0' 5-20-16.xls
**TRIAXIAL SHEAR TEST REPORT**

**GREGORY GEOTECHNICAL SOFTWARE**

<table>
<thead>
<tr>
<th>TOTAL STRESS PARAMETERS</th>
<th>( \phi = 14.4 , \text{deg} )</th>
<th>( c = 2.5 , \text{psi} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIMEN NO.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>INITIAL</td>
<td>AT TEST</td>
</tr>
<tr>
<td>Moisture Content - %</td>
<td>30.3</td>
<td>31.2</td>
</tr>
<tr>
<td>Dry Density - pcf</td>
<td>90.7</td>
<td>87.3</td>
</tr>
<tr>
<td>Diameter - inches</td>
<td>1.39</td>
<td>1.42</td>
</tr>
<tr>
<td>Height - inches</td>
<td>3.22</td>
<td>3.03</td>
</tr>
<tr>
<td>Final Moisture - %</td>
<td>25.5</td>
<td>26.4</td>
</tr>
<tr>
<td>Dry Density - pcf</td>
<td>94.7</td>
<td>92.2</td>
</tr>
<tr>
<td>Calculated Diameter (in.)</td>
<td>1.39</td>
<td>1.40</td>
</tr>
<tr>
<td>Height - inches</td>
<td>3.21</td>
<td>2.99</td>
</tr>
<tr>
<td>Effect. Cell Pressure - psi</td>
<td>11.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Failure Stress - psi</td>
<td>13.65</td>
<td>20.26</td>
</tr>
<tr>
<td>Total Pore Pressure - psi</td>
<td>106.7</td>
<td>113.4</td>
</tr>
<tr>
<td>Strain Rate - inches/min.</td>
<td>0.00161</td>
<td>0.00151</td>
</tr>
<tr>
<td>Failure Strain - %</td>
<td>4.4</td>
<td>6.5</td>
</tr>
<tr>
<td>( \sigma_1 ) Failure - psi</td>
<td>24.65</td>
<td>41.26</td>
</tr>
<tr>
<td>( \sigma_3 ) Failure - psi</td>
<td>11.00</td>
<td>21.00</td>
</tr>
</tbody>
</table>

**TEST DESCRIPTION**

- **TYPE OF TEST & NO:** CU Triaxial - CU-1  
- **SAMPLE TYPE:** SHELBY TUBE  
- **DESCRIPTION:** LEAN CLAY (CL), Light Olive Brown  
- **SAMPLE LOCATION:** B-2, U3, 26.0'-28.0'  
- **ASSUMED SPECIFIC GRAVITY:** 2.70  
- **LL:** 31  
- **PL:** 23  
- **PI:** 8  
- **Percent -200:** 95  

**PROJECT INFORMATION**

- **PROJECT:** PFLUG ROAD CULVERT  
- **LOCATION:** SARPY COUNTY, NE  
- **PROJECT NO:** D9165011  
- **CLIENT:** PARSONS BRINCKERHOFF, INC.  
- **DATE:** 5/20/2016  

---

D9165011 CU B-2, U3, 26.0'-28.0' 5-20-16.xls
UNCONFINED COMPRESSION TEST
ASTM D2166

SPECIMEN FAILRE MODE

Moisture Content: %
Dry Density: pcf
Diameter: in.
Height: in.
Height / Diameter Ratio:
Calculated Saturation: %
Calculated Void Ratio:
Assumed Specific Gravity:
Failure Strain: %
Unconfined Compressive Strength (psf)
Undrained Shear Strength: (psf)
Strain Rate: in/min
Remarks:

SPECIMEN TEST DATA

SAMPLE TYPE: Shelby Tube
DESCRIPTION: Lean Clay
SAMPLE LOCATION: B-2 @ 6 - 8 feet
PROJECT: Pflug Road Culvert, PB Proj #185017, Task 1
SITE: 230th and Pflug Road
Sarpy County, NE
EXHIBIT: LAbORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. UNCONFINED D9165011 LOGS.GPJ TERRACON 2012.GDT 5/27/16

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. UNCONFINED D9165011 LOGS.GPJ TERRACON 2012.GDT 5/27/16

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. UNCONFINED D9165011 LOGS.GPJ TERRACON 2012.GDT 5/27/16

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. UNCONFINED D9165011 LOGS.GPJ TERRACON 2012.GDT 5/27/16
### SPECIMEN TEST DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>31%</td>
</tr>
<tr>
<td>Dry Density</td>
<td>86pcf</td>
</tr>
<tr>
<td>Diameter</td>
<td>2.82 in.</td>
</tr>
<tr>
<td>Height</td>
<td>5.95 in.</td>
</tr>
<tr>
<td>Height / Diameter Ratio</td>
<td>2.11</td>
</tr>
<tr>
<td>Calculated Saturation</td>
<td></td>
</tr>
<tr>
<td>Calculated Void Ratio</td>
<td></td>
</tr>
<tr>
<td>Assumed Specific Gravity</td>
<td></td>
</tr>
<tr>
<td>Failure Strain</td>
<td>13.06%</td>
</tr>
<tr>
<td>Unconfined Compressive Strength (psf)</td>
<td>430</td>
</tr>
<tr>
<td>Undrained Shear Strength (psf)</td>
<td>215</td>
</tr>
<tr>
<td>Strain Rate</td>
<td>0.0536 in/min</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
</tr>
</tbody>
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### SAMPLE INFORMATION

**Sample Type:** Shelby Tube

**Sample Location:** B-2 @ 16 - 18 feet

**Description:**

<table>
<thead>
<tr>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Percent &lt; #200 Sieve</th>
</tr>
</thead>
</table>

**Project:** Pflug Road Culvert, PB Proj #185017, Task 1

**Site:** 230th and Pflug Road

**Client:** Parsons Brinckerhoff, Inc

**Omaha, NE**

**Project Number:** D9165011

**Exhibit:**
UNCONFINED COMPRESSION TEST
ASTM D2166

SPECIMEN TEST DATA

<table>
<thead>
<tr>
<th>SPECIMEN FAILURE MODE</th>
<th>SPECIMEN TEST DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moisture Content:</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Dry Density:</td>
</tr>
<tr>
<td></td>
<td>pcf</td>
</tr>
<tr>
<td></td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Diameter:</td>
</tr>
<tr>
<td></td>
<td>in.</td>
</tr>
<tr>
<td></td>
<td>2.84</td>
</tr>
<tr>
<td></td>
<td>Height:</td>
</tr>
<tr>
<td></td>
<td>in.</td>
</tr>
<tr>
<td></td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td>Height / Diameter Ratio:</td>
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<td></td>
<td>1.53</td>
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<td></td>
<td>Calculated Saturation:</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Calculated Void Ratio:</td>
</tr>
<tr>
<td></td>
<td>Assumed Specific Gravity:</td>
</tr>
<tr>
<td></td>
<td>Failure Strain:</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>4.02</td>
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<tr>
<td></td>
<td>Unconfined Compressive Strength:</td>
</tr>
<tr>
<td></td>
<td>(psf)</td>
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<tr>
<td></td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>Undrained Shear Strength:</td>
</tr>
<tr>
<td></td>
<td>(psf)</td>
</tr>
<tr>
<td></td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>Strain Rate:</td>
</tr>
<tr>
<td></td>
<td>in/min</td>
</tr>
<tr>
<td></td>
<td>0.0282</td>
</tr>
<tr>
<td></td>
<td>Remarks:</td>
</tr>
</tbody>
</table>

SAMPLE TYPE: Shelby Tube
DESCRIPTION: Sandy Silt
SAMPLE LOCATION: B-2 @ 33 - 35 feet

PROJECT: Pflug Road Culvert, PB Proj #185017, Task 1
SITE: 230th and Pflug Road
Sarpy County, NE

EXHIBIT:

PROJECT NUMBER: D9165011
CLIENT: Parsons Brinckerhoff, Inc
Omaha NE

15080 A Cir
Omaha, NE
## Grain Size Distribution

**ASTM D422 / ASTM C136**

### Grain Size in Millimeters

<table>
<thead>
<tr>
<th>U.S. Sieve Opening in Inches</th>
<th>U.S. Sieve Numbers</th>
<th>Hydrometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>1/2</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>3/4</td>
<td>100</td>
</tr>
<tr>
<td>1/8</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>1/16</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>1/32</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>1/64</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>1/128</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>1/256</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>1/512</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>1/1024</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>1/2048</td>
<td>100</td>
<td>0.04</td>
</tr>
</tbody>
</table>

### Percentage Finer by Weight

- **Coarse:**
  - 100 %
- **Fine:**
  - 0 %

### Grain Size Distribution

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Depth</th>
<th>USCS Classification</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>4 - 6</td>
<td>LEAN CLAY (CL)</td>
<td>33</td>
<td>23</td>
<td>10</td>
<td></td>
<td></td>
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</table>

### Particle Size Distribution

<table>
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<tr>
<th>Boring ID</th>
<th>Depth</th>
<th>D&lt;sub&gt;100&lt;/sub&gt;</th>
<th>D&lt;sub&gt;50&lt;/sub&gt;</th>
<th>D&lt;sub&gt;30&lt;/sub&gt;</th>
<th>D&lt;sub&gt;10&lt;/sub&gt;</th>
<th>%Gravel</th>
<th>%Sand</th>
<th>%Fines</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>4 - 6</td>
<td>1.18</td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>2.5</td>
<td>26.0</td>
</tr>
</tbody>
</table>

**Project:** Pflug Road Culvert, PB Proj #185017, Task 1

**Site:** 230th and Pflug Road, Sarpy County, NE

**Laboratory Tests are not valid if separated from original report.**

**Exhibit:**

**Project Number:** D9165011

**Client:** Parsons Brinckerhoff, Inc

**Address:** 15080 A Cir, Omaha, NE
### Project: Pflug Road Culvert, PB Proj #185017, Task 1

**SITE:** 230th and Pflug Road  
Sarpy County, NE

**CLIENT:** Parsons Brinckerhoff, Inc  
Omaha NE

**PROJECT NUMBER:** D9165011

**EXHIBIT:**

#### Sand Content

**Boring ID** | **Depth** | **USCS Classification** | **LL** | **PL** | **PI** | **Cc** | **Cu**
--- | --- | --- | --- | --- | --- | --- | ---
B-2 | 43.5 - 45 | Lean Clay (CL) | 43 | 20 | 23 |

#### Grain Size Distribution

**Boring ID** | **Depth** | **D<sub>100</sub>** | **D<sub>60</sub>** | **D<sub>30</sub>** | **D<sub>10</sub>** | **%Gravel** | **%Sand** | **%Fines**
--- | --- | --- | --- | --- | --- | --- | --- | ---
B-2 | 43.5 - 45 | 2 | 0.023 | 0.004 | 0.0 | 8.7 | 59.3 | 32.0

---

**HYDROMETER**

**U.S. SIEVE OPENING IN INCHES**

6 4 3 2 1 1/4 3/8 3 6 10 14

**U.S. SIEVE NUMBERS**

1 3/16 1/8 1/4 1/2 3/8 6 10 14 16 20 30 40 50 100 140 200

**PERCENT FINER BY WEIGHT**

0.001 0.01 0.1 1 10 100

---

**GRAIN SIZE DISTRIBUTION**

**ASTM D422 / ASTM C136**

**COBBLES**

**GRAVEL**

**SAND**

**SILT OR CLAY**

---

**Boring ID** | **Depth** | **USCS Classification** | **LL** | **PL** | **PI** | **Cc** | **Cu**
--- | --- | --- | --- | --- | --- | --- | ---
B-2 | 43.5 - 45 | Lean Clay (CL) | 43 | 20 | 23 |

---

**Boring ID** | **Depth** | **D<sub>100</sub>** | **D<sub>60</sub>** | **D<sub>30</sub>** | **D<sub>10</sub>** | **%Gravel** | **%Sand** | **%Fines**
--- | --- | --- | --- | --- | --- | --- | --- | ---
B-2 | 43.5 - 45 | 2 | 0.023 | 0.004 | 0.0 | 8.7 | 59.3 | 32.0

---

**PROJECT:** Pflug Road Culvert, PB Proj #185017, Task 1

**SITE:** 230th and Pflug Road  
Sarpy County, NE

**CLIENT:** Parsons Brinckerhoff, Inc  
Omaha NE

**PROJECT NUMBER:** D9165011

**EXHIBIT:**
### GRAIN SIZE DISTRIBUTION

**ASTM D422 / ASTM C136**

**GRAIN SIZE IN MILLIMETERS**

<table>
<thead>
<tr>
<th>U.S. SIEVE OPENING IN INCHES</th>
<th>U.S. SIEVE NUMBERS</th>
<th>HYDROMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>25</td>
</tr>
</tbody>
</table>

**COBBLES | GRAVEL | SAND | SILT OR CLAY**

- coarse
- fine
- medium
- fine

**Boring ID | Depth | USCS Classification | LL | PL | PI | Cc | Cu**

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Depth</th>
<th>USCS Classification</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>Cc</th>
<th>Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>48.5 - 50</td>
<td>Lean Clay with Sand (CL)</td>
<td>44</td>
<td>17</td>
<td>27</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Boring ID | Depth  | D100 | D40 | D30 | D10 | %Gravel | %Sand | %Fines**

<table>
<thead>
<tr>
<th>Boring ID</th>
<th>Depth</th>
<th>D100</th>
<th>D40</th>
<th>D30</th>
<th>D10</th>
<th>%Gravel</th>
<th>%Sand</th>
<th>%Fines</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>48.5 - 50</td>
<td>4.75</td>
<td>0.027</td>
<td></td>
<td>0.0</td>
<td>0.0000</td>
<td>17.8</td>
<td>45.2</td>
</tr>
</tbody>
</table>

**PROJECT:** Pflug Road Culvert, PB Proj #185017, Task 1

**SITE:** 230th and Pflug Road

**Sarpy County, NE**

**CLIENT:** Parsons Brinckerhoff, Inc

**Omaha NE**

**PROJECT NUMBER:** D9165011

**EXHIBIT:**
### Results of Corrosion Analysis

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Sample Location</th>
<th>Sample Depth (ft.)</th>
<th>pH Analysis, AWWA 4500 H</th>
<th>Red-Ox, AWWA 2580, (mV)</th>
<th>Water Soluble Sulfate (SO4), ASTM D 516 (mg/kg)</th>
<th>Sulfides, AWWA 4500-S D, (mg/kg)</th>
<th>Total Salts, AWWA 2510, (mg/kg)</th>
<th>Chlorides, ASTM D 512, (mg/kg)</th>
<th>Resistivity, ASTM G-57, (ohm-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>B-1</td>
<td>4.0-6.0</td>
<td>7.48</td>
<td>+633</td>
<td>113</td>
<td>Nil</td>
<td>336</td>
<td>50</td>
<td>2619</td>
</tr>
</tbody>
</table>

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.
APPENDIX C – GENERAL SOILS REFERENCE INFORMATION

Custom Soil Resource Report for Sarpy County, Nebraska: Pflug Road
Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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  Soil Map..............................................................................................................................8
  Legend...................................................................................................................................9
Map Unit Legend.................................................................................................................10
Map Unit Descriptions......................................................................................................10
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    8138—Pohocco-Ida-Monona complex, 6 to 17 percent slopes..............................13
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    8157—Contrary-Monona-Ida complex, 6 to 17 percent slopes............................17
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the
individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.
The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sarpy County, Nebraska
Survey Area Data: Version 9, Sep 8, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 12, 2011—Oct 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7234</td>
<td>Judson silty clay loam, 2 to 6 percent slopes</td>
<td>53.1</td>
<td>43.9%</td>
</tr>
<tr>
<td>8138</td>
<td>Pohocco-Ida-Monona complex, 6 to 17 percent slopes</td>
<td>19.6</td>
<td>16.2%</td>
</tr>
<tr>
<td>8140</td>
<td>Pohocco-Judson silt loams, 11 to 40 percent slopes</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td>8157</td>
<td>Contrary-Monona-Ida complex, 6 to 17 percent slopes</td>
<td>48.1</td>
<td>39.8%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>120.9</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

**Map Unit Descriptions**

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic
classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
Sarpy County, Nebraska

7234—Judson silty clay loam, 2 to 6 percent slopes

Map Unit Setting

- **National map unit symbol:** 1vfg0
- **Elevation:** 800 to 1,300 feet
- **Mean annual precipitation:** 24 to 36 inches
- **Mean annual air temperature:** 39 to 61 degrees F
- **Frost-free period:** 155 to 175 days
- **Farmland classification:** All areas are prime farmland

Map Unit Composition

- **Judson and similar soils:** 80 percent
- **Minor components:** 20 percent

Estimates are based on observations, descriptions, and transects of the map unit.

Description of Judson

Setting

- **Landform:** Hillslopes
- **Landform position (two-dimensional):** Footslope
- **Landform position (three-dimensional):** Base slope
- **Down-slope shape:** Convex, concave
- **Across-slope shape:** Linear
- **Parent material:** Fine-silty colluvium

Typical profile

- **Ap - 0 to 8 inches:** silty clay loam
- **A - 8 to 30 inches:** silty clay loam
- **AB - 30 to 38 inches:** silty clay loam
- **Bw - 38 to 60 inches:** silty clay loam
- **C - 60 to 80 inches:** silty clay loam

Properties and qualities

- **Slope:** 2 to 7 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Well drained
- **Runoff class:** Medium
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high (0.20 to 0.60 in/hr)
- **Depth to water table:** More than 80 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water storage in profile:** Very high (about 12.3 inches)

Interpretive groups

- **Land capability classification (irrigated):** 3e
- **Land capability classification (nonirrigated):** 2e
- **Hydrologic Soil Group:** C
- **Ecological site:** Silty - Veg. zone 4 (R107XY075NE)
- **Other vegetative classification:** Loam (G107BY100NE)
Minor Components

Kennebec
Percent of map unit: 14 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty Lowland - Veg. zone 4 (R107XY070NE)
Other vegetative classification: Overflow (G107BY500NE)

Ackmore
Percent of map unit: 4 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear

Kezan
Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex, concave
Across-slope shape: Linear
Ecological site: Silty Lowland - Veg. zone 4 (R107XY070NE)
Other vegetative classification: Wet (G107BY900NE)

8138—Pohocco-Ida-Monona complex, 6 to 17 percent slopes

Map Unit Setting
National map unit symbol: 1vfgj
Elevation: 800 to 1,300 feet
Mean annual precipitation: 24 to 36 inches
Mean annual air temperature: 39 to 61 degrees F
Frost-free period: 155 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition
Pohocco and similar soils: 49 percent
Ida and similar soils: 34 percent
Monona and similar soils: 17 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pohocco
Setting
Landform: Loess hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-silty loess

Typical profile
Ap - 0 to 6 inches: silty clay loam
Bw - 6 to 15 inches: silt loam
Bk - 15 to 28 inches: silt loam
C - 28 to 80 inches: silt loam

Properties and qualities
Slope: 6 to 18 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 11.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Silty - Veg. zone 4 (R107XY075NE)
Other vegetative classification: Loam (G107BY100NE)

Description of Ida
Setting
Landform: Loess hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Calcareous loess

Typical profile
Ap - 0 to 6 inches: silt loam
AC - 6 to 12 inches: silt loam
C - 12 to 80 inches: silt loam

Properties and qualities
Slope: 6 to 18 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Very high (about 12.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Limy Upland (R102CY059NE)

Description of Monona

Setting
Landform: Loess hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-silty loess

Typical profile
Ap - 0 to 7 inches: silt loam
A - 7 to 15 inches: silt loam
Bw - 15 to 30 inches: silt loam
C - 30 to 80 inches: silt loam

Properties and qualities
Slope: 6 to 18 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Available water storage in profile: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Silty - Veg. zone 4 (R107XY075NE)

8140—Pohocco-Judson silt loams, 11 to 40 percent slopes

Map Unit Setting
National map unit symbol: 1vfgg
Elevation: 800 to 1,300 feet
Mean annual precipitation: 24 to 36 inches
Mean annual air temperature: 39 to 61 degrees F
Frost-free period: 155 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition
Pohocco, silt loam, and similar soils: 48 percent
Judson and similar soils: 39 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pohocco, Silt Loam

Setting
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex, concave
Across-slope shape: Linear
Parent material: Fine-silty loess

Typical profile
A - 0 to 6 inches: silt loam
Bw - 6 to 15 inches: silt loam
Bk - 15 to 28 inches: silt loam
C - 28 to 80 inches: silt loam

Properties and qualities
Slope: 20 to 54 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 11.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Silty - Veg. zone 4 (R107XY075NE)
Other vegetative classification: Loam (G107BY100NE)

Description of Judson

Setting
Landform: Drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Fine-silty colluvium
Typical profile

- **A - 0 to 30 inches:** silty clay loam
- **AB - 30 to 38 inches:** silty clay loam
- **Bw - 38 to 60 inches:** silty clay loam
- **C - 60 to 80 inches:** silty clay loam

Properties and qualities

- **Slope:** 1 to 12 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Well drained
- **Runoff class:** High
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high (0.20 to 0.60 in/hr)
- **Depth to water table:** More than 80 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water storage in profile:** Very high (about 12.3 inches)

Interpretive groups

- **Land capability classification (irrigated):** 3e
- **Land capability classification (nonirrigated):** 2e
- **Hydrologic Soil Group:** C
- **Ecological site:** Silty - Veg. zone 4 (R107XY075NE)
- **Other vegetative classification:** Loam (G107BY100NE)

Minor Components

- **Kezan, occasionally flooded**
  - **Percent of map unit:** 13 percent
  - **Landform:** Drainageways
  - **Landform position (two-dimensional):** Toeslope
  - **Landform position (three-dimensional):** Base slope
  - **Down-slope shape:** Concave
  - **Across-slope shape:** Linear
  - **Ecological site:** Silty Lowland - Veg. zone 4 (R107XY070NE)

8157—Contrary-Monona-Ida complex, 6 to 17 percent slopes

Map Unit Setting

- **National map unit symbol:** 1vfgm
- **Elevation:** 800 to 1,300 feet
- **Mean annual precipitation:** 24 to 36 inches
- **Mean annual air temperature:** 39 to 61 degrees F
- **Frost-free period:** 155 to 175 days
- **Farmland classification:** Not prime farmland

Map Unit Composition

- **Contrary and similar soils:** 49 percent
- **Monona and similar soils:** 30 percent
Ida and similar soils: 19 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Contrary

Setting
Landform: Loess hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-silty loess

Typical profile
Ap - 0 to 7 inches: silty clay loam
Bw - 7 to 55 inches: silty clay loam
C - 55 to 80 inches: silty clay loam

Properties and qualities
Slope: 9 to 16 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 11.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty - Veg. zone 4 (R107XY075NE)

Description of Ecological site: Silty - Veg. zone 4 (R107XY075NE)

Setting
Landform: Loess hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Fine-silty loess

Typical profile
Ap - 0 to 7 inches: silty clay loam
A - 7 to 15 inches: silt loam
Bw - 15 to 30 inches: silt loam
C - 30 to 80 inches: silt loam

Properties and qualities
Slope: 9 to 16 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 11.7 inches)

Interpretive groups
- Land capability classification (irrigated): 4e
- Land capability classification (nonirrigated): 3e
- Hydrologic Soil Group: B
- Ecological site: Silty - Veg. zone 4 (R107XY075NE)

Description of Ida

Setting
- Landform: Loess hills
- Landform position (two-dimensional): Backslope
- Landform position (three-dimensional): Head slope, side slope, nose slope
- Down-slope shape: Convex
- Across-slope shape: Convex, linear
- Parent material: Calcareous loess

Typical profile
- Ap - 0 to 6 inches: silt loam
- AC - 6 to 12 inches: silt loam
- C - 12 to 80 inches: silt loam

Properties and qualities
- Slope: 9 to 16 percent
- Depth to restrictive feature: More than 80 inches
- Natural drainage class: Well drained
- Runoff class: Medium
- Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None
- Calcium carbonate, maximum in profile: 30 percent
- Available water storage in profile: Very high (about 12.1 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 6e
- Hydrologic Soil Group: B
- Ecological site: Limy Upland (R102CY059NE)

Minor Components

Dickinson
- Percent of map unit: 2 percent
- Landform: Hillslopes
- Landform position (two-dimensional): Backslope
- Landform position (three-dimensional): Side slope
- Down-slope shape: Convex, concave
Across-slope shape: Linear
Ecological site: Sandy - Veg. Zone 4 (R107XY072NE)
Other vegetative classification: Droughty Loam (G107BY120NE)
References


Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the “National Soil Survey Handbook.”

ABC soil
A soil having an A, a B, and a C horizon.

Ablation till
Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil
A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil
The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil
Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil
A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone
A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.
Alluvial fan
A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium
Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl
A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)
The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions
Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon
A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo
The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect
The direction toward which a slope faces. Also called slope aspect.

Association, soil
A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)
The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:
Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope
The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp
A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland
A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada
A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area
The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation
The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)
A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane
A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change
in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

**Bedding system**

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

**Bedrock**

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-controlled topography**

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

**Bench terrace**

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Bisequum**

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

**Blowout (map symbol)**

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

**Borrow pit (map symbol)**

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

**Bottom land**

An informal term loosely applied to various portions of a flood plain.

**Boulders**

Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks**

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.
Breast height
An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management
Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte
An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding
A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil
A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche
A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)
The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy
The leafy crown of trees or shrubs. (See Crown.)
Canyon
A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water
Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena
A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation
An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity
The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps
See Terracettes.

Cement rock
Shaly limestone used in the manufacture of cement.

Channery soil material
Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment
Control of unwanted vegetation through the use of chemicals.

Chiseling
Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque
A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).
Clay
As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter.
As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions
See Redoximorphic features.

Clay film
A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)
A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan
A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community
The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil
Sand or loamy sand.

Cobble (or cobblestone)
A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material
Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)
See Linear extensibility.

Colluvium
Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.
Complex slope
Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil
A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions
See Redoximorphic features.

Conglomerate
A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system
Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage
A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil
Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping
Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section
The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
Coprogenous earth (sedimentary peat)
A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)
A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)
Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop
A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management
Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system
Growing crops according to a planned system of rotation and management practices.

Cross-slope farming
Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown
The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate
A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta
An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)
The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age,
the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave
The walls of excavations tend to cave in or slough.

Decreasers
The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing
Postponing grazing or resting grazing land for a prescribed period.

Delta
A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer
A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)
A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil
Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement
A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth
A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope
A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.
Diversion (or diversion terrace)
A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming
A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)
Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”

Drainage, surface
Runoff, or surface flow of water, from an area.

Drainageway
A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw
A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift
A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin
A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of
streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

**Duff**

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Dune**

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

**Earthy fill**

See Mine spoil.

**Ecological site**

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

**Eluviation**

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Endosaturation**

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

**Eolian deposit**

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

**Ephemeral stream**

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Episaturation**

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

**Erosion**

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (accelerated)
Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)
Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement
A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface
A land surface shaped by the action of erosion, especially by running water.

Escarpment
A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)
A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces.Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)
A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker
A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock
Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth’s surface.

Fallow
Croppeland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown.
The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fan remnant**

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

**Fertility, soil**

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat)**

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity**

The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fill slope**

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

**Fine textured soil**

Sandy clay, silty clay, or clay.

**Firebreak**

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

**First bottom**

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

**Flaggy soil material**

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

**Flagstone**

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
Flood plain
The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms
A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay
A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step
An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial
Of or pertaining to rivers or streams; produced by stream or river action.

Foothills
A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope
The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb
Any herbaceous plant not a grass or a sedge.

Forest cover
All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type
A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan
A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.
**Green manure crop (agronomy)**
A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water**
Water filling all the unblocked pores of the material below the water table.

**Gully (map symbol)**
A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Hard bedrock**
Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hard to reclaim**
Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Hardpan**
A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Head slope (geomorphology)**
A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

**Hemic soil material (mucky peat)**
Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-residue crops**
Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill**
A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.
Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.
L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.
A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
Cr horizon: Soft, consolidated bedrock beneath the soil.
R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.
W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.
Igneous rock
Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation
The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil
A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers
Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration
The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity
The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate
The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate
The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5
Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

- **Basin**: Water is applied rapidly to nearly level plains surrounded by levees or dikes.
- **Border**: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
- **Controlled flooding**: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
- **Corrugation**: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
- **Drip (or trickle)**: Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
- **Furrow**: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
- **Sprinkler**: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
- **Subirrigation**: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
- **Wild flooding**: Water, released at high points, is allowed to flow onto an area without controlled distribution.
Kame
A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)
A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll
A small, low, rounded hill rising above adjacent landforms.

Ksat
See Saturated hydraulic conductivity.

Lacustrine deposit
Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain
A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace
A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)
An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide
A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones
Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)
A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.
Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at \(1/3\)- or \(1/10\)-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.
Mass movement
A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses
See Redoximorphic features.

Meander belt
The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar
A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll
One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment
Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil
Very fine sandy loam, loam, silt loam, or silt.

Mesa
A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock
Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)
An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil
An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.
Mineral soil
Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage
Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area
A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)
Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil
Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil
Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon
A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine
In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil
The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil
Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).
Mountain
A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck
Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat
See Hemic soil material.

Mudstone
A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation
A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon
A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil
A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules
See Redoximorphic features.

Nose slope (geomorphology)
A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant
Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, fragipan, claypan, plowpan, and traffic pan.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.
Pedon
The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation
The movement of water through the soil.

Perennial water (map symbol)
Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost
Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value
A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil
A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping
Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting
Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit
The moisture content at which a soil changes from semisolid to plastic.

Plasticity index
The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)
A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.
Playa
The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite
The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan
A compacted layer formed in the soil directly below the plowed layer.

Ponding
Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded
Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings
See Redoximorphic features.

Potential native plant community
See Climax plant community.

Potential rooting depth (effective rooting depth)
Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning
Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil
The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil
A vertical section of the soil extending through all its horizons and into the parent material.
Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

- **Ultra acid**: Less than 3.5
- **Extremely acid**: 3.5 to 4.4
- **Very strongly acid**: 4.5 to 5.0
- **Strongly acid**: 5.1 to 5.5
- **Moderately acid**: 5.6 to 6.0
- **Slightly acid**: 6.1 to 6.5
- **Neutral**: 6.6 to 7.3
- **Slightly alkaline**: 7.4 to 7.8
- **Moderately alkaline**: 7.9 to 8.4
- **Strongly alkaline**: 8.5 to 9.0
- **Very strongly alkaline**: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they
form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; and
   B. Masses, which are noncemented concentrations of substances within the soil matrix; and
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; and
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. Reduced matrix.—This is a soil matrix that has low chroma in situ but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

**Reduced matrix**

See Redoximorphic features.

**Regolith**

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

**Relief**

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

**Residuum (residual soil material)**

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

**Rill**

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.
Riser
The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut
A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments
Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)
An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone
The part of the soil that can be penetrated by plant roots.

Runoff
The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil
A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)
An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand
As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone
Sedimentary rock containing dominantly sand-sized particles.
Sandy spot (map symbol)
A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)
The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)
The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy’s Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as “Ksat.” Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)
High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)
Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)
Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)
Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)
Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation
Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification
The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock
A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum
A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)
Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.
Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds
and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

**Slow refill**

The slow filling of ponds, resulting from restricted water transmission in the soil.

**Slow water movement**

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

**Sodic (alkali) soil**

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

**Sodic spot (map symbol)**

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

**Sodicity**

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺ to Ca²⁺ + Mg²⁺. The degrees of sodicity and their respective ratios are:

- **Slight**: Less than 13:1
- **Moderate**: 13-30:1
- **Strong**: More than 30:1

**Sodium adsorption ratio (SAR)**

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

**Soft bedrock**

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil**

A natural, three-dimensional body at the earth’s surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

**Soil separates**

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:
Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum
The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)
A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line
In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones
Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony
Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)
A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace
A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace
One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents
the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

**Stripcropping**
Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

**Structure, soil**
The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:
- **Platy**: Flat and laminated
- **Prismatic**: Vertically elongated and having flat tops
- **Columnar**: Vertically elongated and having rounded tops
- **Angular blocky**: Having faces that intersect at sharp angles (planes)
- **Subangular blocky**: Having subrounded and planar faces (no sharp angles)
- **Granular**: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:
- **Single grained**: Entirely noncoherent (each grain by itself), as in loose sand
- **Massive**: Occurring as a coherent mass

**Stubble mulch**
Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil**
Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling**
Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

**Substratum**
The part of the soil below the solum.

**Subsurface layer**
Any surface soil horizon (A, E, AB, or EB) below the surface layer.

**Summer fallow**
The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.
Summit
The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer
The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil
The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus
Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts
Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine
An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)
An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)
A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes
Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.
Texture, soil
The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer
Otherwise suitable soil material that is too thin for the specified use.

Till
Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain
An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil
The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope
The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil
The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements
Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread
The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff
A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.
**Upland**

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

**Valley fill**

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

**Variegation**

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve**

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Very stony spot (map symbol)**

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

**Water bars**

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Weathering**

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

**Well graded**

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wet spot (map symbol)**

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.
**Wilting point (or permanent wilting point)**

The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow**

The uprooting and tipping over of trees by the wind.
APPENDIX D – Nebraska Water Well & Test Hole Records

Test Hole 7-A-00
Test Hole 8-A-00
G-079561
G-151367
G-114279
G-087787
Test-hole No. 7-A-00  
(13N-10E-26ABBA)  
Sarpy County

Legal Description: T13N, R10E, Sec 26, NE NW NW NE  
Footages from Section Lines: South 70.0 ft; West 2110.0 ft
Latitude: 41.074216 [41d 4m 27.178s]  
Longitude: -96.260616 [-96d 15m 38.218s]  
Source Lat/Long: GIS derived - Datum: NAD27
USGS Quad Map Name: Ashland East  
Nat. Res. District: Papio-Missouri River  
Ground Elevation: 1275.0 ft  
Source Elev: USGS 7.5-min topographic map  
Depth to Water: N/a  
Geophysical Log(s): Yes

Note: Lithologic information has been transcribed verbatim from field notes; log summary and stratigraphic interpretation is not available

<table>
<thead>
<tr>
<th>Depth, in feet</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt, mod clyy</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Silt, mod clyy; brn</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Silt, mod clyy</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Silt, mod clyy; yell brn</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Silt, mod clyy; fine mottles</td>
<td>10.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Note: V poor sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt, mod clyy; gry</td>
<td>17.0</td>
<td>22.0</td>
</tr>
<tr>
<td>Silt, mod clyy; gry</td>
<td>22.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Note: Poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt, mod clyy; few mottles; gry</td>
<td>27.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Note: Better sample</td>
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<tr>
<td>Silt, mod clyy; common mottles; gry</td>
<td>32.0</td>
<td>34.0</td>
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<tr>
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<td>37.0</td>
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<td>37.0</td>
<td>39.0</td>
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<tr>
<td>Silt, mod clyy; dk brn</td>
<td>39.0</td>
<td>42.0</td>
</tr>
<tr>
<td>Silt, v cly</td>
<td>42.0</td>
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</tr>
<tr>
<td>Silt, v cly; brn</td>
<td>47.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Silt, mod clyy; brn</td>
<td>52.0</td>
<td>54.0</td>
</tr>
<tr>
<td>Silt, mod clyy; brn</td>
<td>54.0</td>
<td>57.0</td>
</tr>
<tr>
<td>Clay, slty; many contain few granules; possibly till.</td>
<td>57.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Note: V poor sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay, slty; possibly till</td>
<td>62.0</td>
<td>67.0</td>
</tr>
<tr>
<td>Note: Poor sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Till, cly; mod sdy; mn stains; qtzs; pebble</td>
<td>67.0</td>
<td>72.0</td>
</tr>
<tr>
<td>Till, cly; mod sdy; sdier toward base; limestone pebble; stains as above</td>
<td>72.0</td>
<td>77.0</td>
</tr>
<tr>
<td>Till, sdy; stains; yell brn</td>
<td>77.0</td>
<td>82.0</td>
</tr>
<tr>
<td>Till, sdy; yell brn</td>
<td>82.0</td>
<td>87.0</td>
</tr>
<tr>
<td>Till, v sdy; color mixed; few pebbles; stains; sd in lower 1 ft</td>
<td>87.0</td>
<td>92.0</td>
</tr>
<tr>
<td>Till, v sdy; color mixed; few pebbles; stains</td>
<td>92.0</td>
<td>97.0</td>
</tr>
<tr>
<td>Till, mod sdy; mottles; common granules</td>
<td>97.0</td>
<td>102.0</td>
</tr>
<tr>
<td>Till, mod sdy; stains; limestone pebbles; common granules</td>
<td>102.0</td>
<td>107.0</td>
</tr>
<tr>
<td>Till, mod sdy; stains; qtzs; pebbles; common granules</td>
<td>107.0</td>
<td>112.0</td>
</tr>
<tr>
<td>Till, mod sdy; mixed color</td>
<td>112.0</td>
<td>117.0</td>
</tr>
<tr>
<td>No sample, prob till</td>
<td>117.0</td>
<td>122.0</td>
</tr>
<tr>
<td>Sand, poorly sorted; med-crs grains; qtz; chert</td>
<td>122.0</td>
<td>127.0</td>
</tr>
<tr>
<td>Sand, poorly sorted; med-crs grains as above</td>
<td>127.0</td>
<td>137.0</td>
</tr>
</tbody>
</table>
Sand, poorly sorted; med-crs grains; qtz; chert...... 137.0 152.0
Sand, poorly sorted; med-crs grains; qtz; chert...... 152.0 157.0
Note: Out of water, pit leaking
Test-hole No. 8-A-00
(13N-10E-27DAAA)
Sarpy County

Legal Description: T13N, R10E, Sec 27, SE NE NE NE
Footages from Section Lines: South 2700.0 ft; West 60.0 ft
Latitude: 41.066896 [41d 4m 0.825s]
Longitude: -96.272381 [-96d 16m 20.57s]
Source Lat/Long: GIS derived - Datum: NAD27
USGS Quad Map Name: Ashland East
Nat. Res. District: Papio-Missouri River
Ground Elevation: 1265.0 ft
Source Elev: USGS 7.5-min topographic map
Depth to Water: N/a
Geophysical Log(s): No
Note: Lithologic information has been transcribed verbatim from field
notes; log summary and stratigraphic interpretation is not
available

| Depth, in feet From     To   |
|-------------------------|---------|
| Silt, sl clyy................. 0.0  5.0 |
| Note: V poor sample; lost circ almost imm, put 1.5 bags BenSeal in the hole, lost water rapidly |
| Silt, sl clyy..................... 5.0  10.0 |
| Silt, sl clyy; prob mott........... 10.0  17.0 |
| Silt, sl clyy....................... 17.0  22.0 |
| Silt, sl clyy......................... 22.0  27.0 |
| Silt, sl clyy......................... 27.0  32.0 |
| Silt, sl clyy; prob mottled.......... 32.0  35.0 |
| Silt, sl-mod clyy; prob mottled...... 35.0  37.0 |
| Note: Still losing water |
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
STATE OF NEBRASKA  
DEPARTMENT OF WATER RESOURCES  
WATER WELL REGISTRATION  
FOR DEPARTMENT USE ONLY

Registration Date 4-29-96  Sequence No. 90497  Registration No. 6-87787  
Owner Code No. 14444  Receipt No. 26483 In Papio-Missouri River NRD

1. Well Owner: James K. Bennell  
Address: 1014 Douglas On The Wall  
City: Omaha  
State: NE  
Zip Code: 68102  
Telephone Number (402) 346-8754

2. Drilling Firm: B.G. Christopherson & Sons, Inc  
Address: 3818 Storage Road  
City: Omaha  
State: NE  
Zip Code: 68136  
Telephone Number (402) 895-2047  
Contractor's License No. 39332

3. Permit Number(s): none Required

4. Purpose of well (indicate one):  
- Dewatering (over 90 days)  
- Domestic  
- Industrial  
- Ground Heat Exchanger  
- Observation  
- Public Water Supply (with or without recharge)  
- Public Water Supply (without recharge)  
- Recovery  
- Aquaculture  
- Other  
(indicate use)

5. Replacement and abandoned well information:  
A. Is this well a replacement well?  
- Yes  
- No  
B. Registration number of abandoned well:  
C. Replacement well is ___ feet from abandoned well.  
D. Abandoned well last operated ___  
E. Original well pump column size ___ inches.  
F. Completion of original well abandonment on ___ ___  
G. Location of water use of abandoned well:  

6. A. Well location: X Lot of the 2-A subdivision 22 Township: 13 North Range: 10 East, Sarpy County  
B. The well is ___ feet from the North Section line and ___ feet from the East Section line.  
C. Street address or block, lot and subdivision, if applicable:  
D. Location of water use, if applicable (give legal description):  
E. If for irrigation, the land to be irrigated is ___ acres.  
F. Well reference letter(s), if applicable:

7. Pump Information:  
A. Pump installed at this time?  
- Yes  
- No  
B. Actual pumping rate, if applicable: ___ gallons per minute.  
C. Pump column diameter: ___ inches.  
D. Pumping equipment installed: ___ feet.  
E. Pumping equipment installed: ___ feet.  
F. Pump installed by:  
- Contractor  
- Owner  
- Pump Installer  
- License No.
8. Well Construction Information:

A. Total well depth: 100 feet  
B. Static water level: 73.5 feet  
C. Pumping water level: 73.6 feet  
D. Well construction began: 3-18-96  
E. Well construction completed: 3-19-96  
F. Bore hole diameter: 8.3/4 inch(a)  
G. Pipe Size: Diameter: 4 OD, ID: 3  
H. Pipe material: Type of material: Schedule 40 PVC

9. Geologic Materials Logged:

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Description</th>
<th>Depth in Feet</th>
<th>Description</th>
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<tbody>
<tr>
<td>FROM</td>
<td>TO</td>
<td>FROM</td>
<td>TO</td>
</tr>
<tr>
<td>0-3'</td>
<td>Brown loess</td>
<td>0-3'</td>
<td>Brown loess</td>
</tr>
<tr>
<td>5-15'</td>
<td>Sandy brown loess</td>
<td>15-19'</td>
<td>Silty brown loess</td>
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<tr>
<td>19-44'</td>
<td>Sandy brown loess</td>
<td>44-65'</td>
<td>Brown clay</td>
</tr>
<tr>
<td>65-106'</td>
<td>Sandy brown clay</td>
<td>67-70'</td>
<td>Brown sand (20-25)</td>
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<td>70-75'</td>
<td>Brown sand (25-35)</td>
<td>75-80'</td>
<td>Brown sand (30-40)</td>
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<tr>
<td>80-96'</td>
<td>Brown sand (40-50)</td>
<td>96-108'</td>
<td>Brown and gray shale</td>
</tr>
<tr>
<td>98-100'</td>
<td>Blue shale</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Additional sheets may be submitted)

10. I am familiar with the information submitted on this application, and to the best of my knowledge, it is true:

Water Well Contractor's Signature: [Signature]  
Date: 4-10-96  
Water Well Owner's Signature: [Signature]  
Date: 4-11-96
**STATE OF NEBRASKA**  
**DEPARTMENT OF NATURAL RESOURCES**  
**WATER WELL REGISTRATION**

**FOR DEPARTMENT USE ONLY**

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<td>NOL Date</td>
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<tr>
<td>Seq Num</td>
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</table>

**1a Owner's Name**  
Holy Family Shrine

**b Company Name**  
Holy Family Shrine

**c Correspondent Name**  
Holy Family Shrine

**Address**  
23132 Pflug Road

**City**  
Gretna

**State**  
NE

**Zip Code**  
68028

**Phone**  

**2a HNSS Contractor License ID:**  
165656

**2b Drilling Firm Name**  
Jensen Well Co., Inc.

**3a Well Location**  
NWNE 27 Township 13 North, Range 10 E (W), Sarpy County

**b Natural Resource District**  
Papio-Missouri River

**c The well is**  
220 feet from the N (N/S) section line and 1703 feet from the E (E/W) section line

**GPS or Latitudes**  
41 04' 25.40"

**Longitudes**  
96 16' 42.90"

**d Street address or block, lot and subdivision, if applicable**  
23132 Pflug Road

**e Location of water use, if applicable (give legal descriptions)**  
same

**f If for irrigation, the land to be irrigated is**  

**g Well Reference Letter(s), if applicable**  

**4 Permits**

<table>
<thead>
<tr>
<th>Management Area Permit</th>
<th>Permits Number</th>
<th>Date</th>
<th>Permits</th>
<th>Permits Number</th>
<th>Date</th>
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<td>Transfer Out-Of-State</td>
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<tr>
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<th>Municipal</th>
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<table>
<thead>
<tr>
<th>Industrial Transfer Notice</th>
<th></th>
<th></th>
<th>Other</th>
</tr>
</thead>
</table>

**5 Purpose of Well**  
Domestic

**Other**

**Notes**

**6 Wells in a Series**

a) Is this well a part of a series?  

b) If one or more of the wells in the series is currently registered, give the well registration number

**7 Replacement and abandoned well Information**

<table>
<thead>
<tr>
<th>Replacement Number</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

a) Is this well a replacement well?  

b) Registration number of original well

Original well pump column size:  
inches.
8 Pump Information

a Is pump installed at this time? ☑

b Is pump installed by well owner in section 12? ☐

c Is pump installed by contractor in section 2? ☑

d Be installed by pump installer.

e HNIS Installer's License ID.

f Pump Installer's License No.

Pump Installer's Name

Pump Installer's Firm Name

Pump Installer's Firm Address

Pump Installer's Firm Email Address

City:

State

Zip Code

-0000

Phone

c Pumping Rate 5 gallons per minute

d Drop pipe diameter 1.25 inches

e Length of drop pipe 110. feet

f Pumping equipment installed 08 / 14 / 2008

g Pump Brand Goulds

h This well will be used to pump less than 50 gpm ☑

9 Well Construction Information

a Total well depth 120. feet

c Pumping Water Level 106. feet

e Well construction completed 08 / 13 / 2008

g Casing and Screen joints Glued Other

b Static Water Level 106. feet

d Well construction began 08 / 12 / 2008

f Bore hole diameter in inches, Top 8.75 Bottom 8.75

10 Well Construction (Casing and Screen)

<table>
<thead>
<tr>
<th>Fr Depth</th>
<th>To Depth</th>
<th>Case Cm</th>
<th>Ins Diam</th>
<th>Out Diam</th>
<th>Thickness</th>
<th>Screen Slot Size</th>
<th>Material</th>
<th>Trade name</th>
<th>NOLID</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>113 casing</td>
<td>4</td>
<td>4.5</td>
<td>.237</td>
<td>sch40 pvc</td>
<td>creline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>118 screen</td>
<td>4</td>
<td>4.5</td>
<td>.237</td>
<td>.010 sch40 pvc</td>
<td>jayc0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>120 casing</td>
<td>4</td>
<td>4.5</td>
<td>.237</td>
<td>sch40 pvc</td>
<td>creline</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11 Well Construction (Grout and Gravel)

<table>
<thead>
<tr>
<th>NOL ID</th>
<th>From Depth</th>
<th>To Depth</th>
<th>Grout/Gravel</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>12271163707285</td>
<td>6</td>
<td>12 grout</td>
<td>bentonite</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>12</td>
<td>120 gravel</td>
<td>redimix</td>
<td></td>
</tr>
<tr>
<td>NOL ID</td>
<td>From Depth</td>
<td>To Depth</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>------------</td>
<td>----------</td>
<td>------------------------------------</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>0</td>
<td>27</td>
<td>light brown clay</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>27</td>
<td>35</td>
<td>sandy light brown clay</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>35</td>
<td>88</td>
<td>light brown and gray clay</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>88</td>
<td>93</td>
<td>medium yellow sand</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>93</td>
<td>98</td>
<td>gray shale</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>98</td>
<td>105</td>
<td>coarse brown sandstone</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>105</td>
<td>118</td>
<td>fine yellow sandstone</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>118</td>
<td>128</td>
<td>red shale</td>
<td></td>
</tr>
<tr>
<td>12271163707285</td>
<td>128</td>
<td>131</td>
<td>limestone</td>
<td></td>
</tr>
</tbody>
</table>
Township Range Section Report

Registration#: G-114279  
Sarpy County

Subsection: SWSE  
Section: 22  
Township: 13  
Range: 10E

Footage: 489 feet from the South section line and 1552 feet from the East section line.  
(489N 1552W)

Latitude: 41°04'32.40"  
Longitude: 096°16'41.00"

http://dnrserver26.dnr.state.ne.us/llcalc/LLCalc.asp?latd=41&latm=04&lats=32.40&longd=096&longm=16&longs=41.00  
3/11/02
### STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION or AREA PERMIT
FOR DEPARTMENT USE ONLY

<table>
<thead>
<tr>
<th>NGL ID</th>
<th>702783106476582</th>
<th>NGL Status</th>
<th>Accepted</th>
<th>Wet Status</th>
<th>Well Well</th>
<th>Registration Code</th>
<th>Call Up Code</th>
<th>Registration Date</th>
<th>Call Up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner ID</td>
<td>429444</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>SeqNum</td>
<td>1287065</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Date:** Monday, February 04, 2002

---

**STATE OF NEBRASKA**
DEPARTMENT OF WATER RESOURCES
WATER WELL REGISTRATION or AREA PERMIT
FOR DEPARTMENT USE ONLY

<table>
<thead>
<tr>
<th>NGL ID</th>
<th>702783106476582</th>
<th>NGL Status</th>
<th>Accepted</th>
<th>Wet Status</th>
<th>Well Well</th>
<th>Registration Code</th>
<th>Call Up Code</th>
<th>Registration Date</th>
<th>Call Up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner ID</td>
<td>429444</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

1a Owner's Name
b Company Name
HOLY FAMILY FOUNDATION
c Correspondent Name

<table>
<thead>
<tr>
<th>Address</th>
<th>Ch.</th>
<th>State</th>
<th>Zip Code</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMHMA</td>
<td>NE</td>
<td>68124</td>
<td>2012</td>
<td></td>
</tr>
</tbody>
</table>

2a NGLS Contractor Inc.
Contractor's License No: 07222
Contractor's Email Address: johnson@holyfamily.org
b Drilling Firm Name
Johanson Well Co., Inc.

c Drilling Firm's Email Address

<table>
<thead>
<tr>
<th>State</th>
<th>Zip Code</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE</td>
<td>68124</td>
<td>402</td>
</tr>
</tbody>
</table>

3a Well Location

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Section of</th>
<th>Township 12</th>
<th>North, Range 1D</th>
<th>N.E. (NEAV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>South</td>
<td>County</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b Natural Resource District
Post-Pluvial Sand

c The well is
feet [ ] NWS and [ ] EWS from the nearest section line
Well Depth: [ ] feet [ ] NWS and [ ] EWS
Off-Set Longitude: [ ] feet [ ] NWS and [ ] EWS
GPS or Latitude: [ ] feet [ ] NWS and [ ] EWS

3d Street address or block, lot and subdivision, if applicable:
3e Location of water use, if applicable (give legal description)
N/A

3f For irrigation, the land to be irrigated is
Acres

3g Well Reference Letters, if applicable

---

4a Permit

<table>
<thead>
<tr>
<th>Permit</th>
<th>Permit Number</th>
<th>Permit Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4b Well Use

<table>
<thead>
<tr>
<th>Well Use</th>
<th>Permit Number</th>
<th>Permit Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer Out-Of-State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well Sealing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduit Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4c Notes

---

5a Number of Wells
Second Heat Exchanger

---

6a Wells In a Series
### Water Well Registration or Area Permit

**NOL ID:** 101258100425559  
**NOL Status:**  
**Owner ID:** 60236  
**NOL Date:** 02/02/2002  
**Call Up Code:**  
**Registration Code:**  
**Registration Date:**  
**Call Up Date:**

#### 1. Replacement and abandoned well information

- **Replacement Number:**
- **Registration number of abandoned well:**
- **Replacement well is:**
- **Feet from abandoned well:**
- **Abandoned well last operated:**
- **Completion of original well abandonment on:**
- **Location of water use of abandoned well:**

#### 2. Pump information

- **Is pump installed by contractor in section 9:**
- **Is pump installed by well owner in section 10:**
- **Installed by pump installation:**
- **Pump installation:**
- **Pump installed:**
- **Pump installation:**
- **City:**
- **State:**
- **Zip Code:**
- **Phone:**
- **Pump Installer's Firm Name:**
- **Pump Installer's Firm Email Address:**
- **Pump Model:**
- **Pump Brand:**
- **Installed:**
- **Measured or estimated:**
- **Length of drop pipe:**

#### 3. Well Construction Information

- **Total well depth:** 140 feet
- **Drop pipe diameter:** 2 inches
- **Well construction began:** 12/1/2001
- **Bore hole diameter in inches:**
- **Top:**
- **Bottom:**
- **Material:**
- **Screen Trade of Cas:**

#### From Depth | To Depth | Inside Diam | Outside Diam | Case Thickness | Screen Slot Size | Material | Screen Trade of Cas
--- | --- | --- | --- | --- | --- | --- | ---
0 | 140 | .75 | 1.05 | .75 | 0 POLYETHYLE VANGUARD
<table>
<thead>
<tr>
<th>NOL ID</th>
<th>From Depth</th>
<th>To Depth</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>10125810642</td>
<td>0.57</td>
<td>42.46</td>
<td>LIGHT BROWN CLAY</td>
</tr>
<tr>
<td>10125810642</td>
<td>57.70</td>
<td>70.75</td>
<td>LIGHT GRAY CLAY</td>
</tr>
<tr>
<td>10125810642</td>
<td>70.75</td>
<td>76.97</td>
<td>STONES AND BROWN SAND</td>
</tr>
<tr>
<td>10125810642</td>
<td>76.97</td>
<td>97.98</td>
<td>GRAY SHALE</td>
</tr>
<tr>
<td>10125810642</td>
<td>97.98</td>
<td>98.105</td>
<td>HARDLAYER</td>
</tr>
<tr>
<td>10125810642</td>
<td>98.105</td>
<td>105.118</td>
<td>SHALE WITH SANDSTONE LAYERS</td>
</tr>
<tr>
<td>10125810642</td>
<td>105.118</td>
<td>119.142</td>
<td>SANDSTONE</td>
</tr>
<tr>
<td>10125810642</td>
<td>119.142</td>
<td>141.42</td>
<td>LIMESTONE WITH SHALE LAYERS</td>
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APPENDIX E – SLOPE STABILITY CALCULATIONS
### Slope Stability Analysis - Summary

<table>
<thead>
<tr>
<th>Case</th>
<th>Analysis</th>
<th>FOS</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Roadway Stability - Existing Conditions Cross Section 1</td>
<td>Total Stress</td>
<td>1.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>Roadway Stability - Existing Conditions Cross Section 2</td>
<td>Total Stress</td>
<td>1.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.70</td>
<td></td>
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<tr>
<td>Roadway Stability - Existing Conditions Cross Section 3</td>
<td>Total Stress</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td>Stockpile Stability - Existing Conditions</td>
<td>Total Stress</td>
<td>1.51</td>
<td>Models stockpile surcharge at the edge</td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.18</td>
<td>Checked for a critical failure surface passing below the toe of the slope.</td>
</tr>
<tr>
<td>Stockpile Stability Area - Existing Conditions</td>
<td>Total Stress</td>
<td>1.55</td>
<td>Models stockpile surcharge at 15 ft from the edge</td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.24</td>
<td></td>
</tr>
<tr>
<td>Stockpile Stability Area - 1 to 1 Slope</td>
<td>Total Stress</td>
<td>1.38</td>
<td>Assumes a 1 to 1 slope and stockpile surcharge at 5 ft from the edge</td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>Stockpile Stability Area - Bench</td>
<td>Total Stress</td>
<td>1.44</td>
<td>Assumes a 10 ft middle beach and 1 to 1 slopes and stockpile surcharge at the edge</td>
</tr>
<tr>
<td></td>
<td>Effective Stress</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>Stockpile Stability Area - Bench</td>
<td>Total Stress</td>
<td>1.94</td>
<td>Assumes a 10 ft middle beach and 1 to 1 slopes and no stockpile surcharge</td>
</tr>
</tbody>
</table>
Cross Section 1

Total Stress Analysis

- UW = 101 pcf
  c = 1000 psf
- UW = 115 pcf
  c = 360 psf
  phi = 14.4
- UW = 125 pcf
  c = 4500 psf
  Phi = 38

240 psf roadway surcharge

Distance:
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

Elevation:
1,060 1,070 1,080 1,090 1,100 1,110 1,120 1,130 1,140 1,150 1,160
Effective Stress Analysis

Cross Section 1

240 psf roadway surcharge

- \( c' = 216 \text{ psf} \)
- \( \phi' = 29.7 \)
- \( c = 4500 \text{ psf} \)
- \( \phi = 38 \)
- \( U_W = 101 \text{ pcf} \)
- \( U_W = 115 \text{ pcf} \)
- \( U_W = 125 \text{ pcf} \)
Total Stress Analysis

240 psf roadway surcharge

Cross Section 2

Distance 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

Elevation 1,060 1,070 1,080 1,090 1,100 1,110 1,120 1,130 1,140 1,150

UW = 101 pcf
c = 1000

UW = 115 pcf
c = 360 psf
phi = 14.4

UW = 125 pcf
c = 4500 psf

Phi = 38
Effective Stress Analysis

Cross Section 2

Distance

Elevation

UW = 101 pcf
\( c' = 216 \) psf
\( \phi' = 29.7 \)

240 psf roadway surcharge

UW = 115 pcf
\( c' = 216 \) psf
\( \phi' = 29.7 \)

UW = 125 pcf
\( c = 4500 \) psf

UW = 125 pcf
\( \Phi = 38 \)
Total Stress Analysis

240 psf roadway surcharge

Cross Section 3

Distance

Elevation

UW = 101 pcf

\( c = 1000 \)

UW = 101 pcf

\( c = 1000 \)

UW = 115 pcf

\( c = 360 \text{ psf} \)

\( \phi = 14.4 \)

UW = 125 pcf

\( c = 4500 \text{ psf} \)

UW = 125 pcf

\( \Phi = 38 \)
Effective Stress Analysis

Cross Section 3

240 psf roadway surcharge

\[ c = 4500 \text{ psf} \]

\[ \Phi = 38 \]

\[ c' = 216 \text{ psf} \]

\[ \phi' = 29.7 \]

UW = 101 pcf

UW = 115 pcf

UW = 125 pcf
Total Stress Analysis

Distance (ft) 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

Elevation

UW = 101 pcf  
c' = 1000 psf

Stockpile - Assumed 4 ft of 110.2 pcf material

UW = 101 pcf  
c = 1000 psf

UW = 115 pcf  
c = 360 psf  
phi = 14.4

UW = 125 pcf  
c = 4500 psf

UW = 125 pcf  
phi = 38
Effective Stress Analysis

Stockpile - Assumed 4 ft of 110.2 pcf material

UW = 101 pcf
c' = 216 psf
phi' = 29.7

UW = 115 pcf
c' = 216 psf
phi' = 29.7

UW = 125 pcf
c = 4500 psf

UW = 125 pcf
Phi = 38
Effective Stress Analysis

Checking for failure surfaces at the toe of the slope

Stockpile - Assumed 4 ft of 110.2 pcf material

UW = 101 pcf
c' = 216 psf
phi' = 29.7

UW = 115 pcf
c' = 216 psf
phi' = 29.7

UW = 25 pcf
c = 4500 psf

UW = 125 pcf
phi = 38
Total Stress Analysis

Stockpile - Assumed 4 ft of 110.2 pcf material

- UW = 101 pcf, c' = 1000 psf
- UW = 115 pcf, c = 360 psf, phi = 14.4
- UW = 125 pcf, c = 4500 psf
- UW = 125 pcf, phi = 38
Effective Stress Analysis

Stockpile - Assumed 4 ft of 110.2 pcf material

- UW = 101 pcf
- c' = 216 psf
- phi' = 29.7

- UW = 115 pcf
- c' = 216 psf
- phi' = 29.7

- UW = 125 pcf
- c = 4500 psf

- UW = 125 pcf
- Phi = 38
Total Stress Analysis

UW = 101 pcf
c = 1000 psf

Stockpile - Assumed 8 ft of 110.2 pcf material

UW = 115 pcf
c = 360 psf
phi' = 14.4

UW = 125 pcf
c = 4500 psf

UW = 125 pcf
Phi = 38
Effective Stress Analysis

Stockpile - Assumed 8 ft of 110.2 pcf material

UW = 101 pcf
c' = 216 psf
\( \phi' = 29.7 \)

UW = 115 pcf
c' = 216 psf
\( \phi' = 29.7 \)

UW = 125 pcf
c = 4500 psf

UW = 125 pcf
\( \Phi = 38 \)
Total Stress Analysis

Models
Stockpile and 10 ft wide middle bench with 1 to 1 slopes
Effective Stress Analysis

Models
Stockpile and 10 ft wide middle bench with 1 to 1 slopes

UW = 101 pcf
\( c' = 216 \text{ psf} \)
\( \phi' = 29.7 \)

UW = 115 pcf
\( c' = 216 \text{ psf} \)
\( \phi' = 29.7 \)

UW = 125 pcf
\( c = 4500 \text{ psf} \)

UW = 125 pcf
\( \phi = 38 \)
Total Stress Analysis

Models
No stockpile and 10 ft wide middle bench with 1 to 1 slopes
Effective Stress Analysis

Models
No stockpile and 10 ft wide middle bench
with 1 to 1 slopes

UW = 101 pcf
c' = 216 psf
\( \phi' = 29.7 \)

UW = 115 pcf
c' = 216 psf
\( \phi' = 29.7 \)

UW = 125 pcf
c = 4500 psf

UW = 125 pcf
\( \phi = 38 \)
Addendum #2
December 8, 2017

Pflug Road – 228th Street to 230th Street, Project C-77 (15-14)
For the
Public Works Department

1. PRE-BID MEETING:
A Pre-Bid Meeting was held at the project site on Thursday, December 07, 2017 at 8:00 am regarding the proposed improvements. Participating parties are included in the attached sign-in sheet.

2. CONTRACTOR QUESTIONS

Question 1. When is the anticipated start date for construction?
Response: County wishes to start as soon as possible and complete the work as the roadway is currently closed. The project is a 30-working day project, however, the County understands that winter weather may be a factor in carrying out the work.

Question 2. Who is responsible for testing the soil?
Response: Contractor is responsible to test and show proof of acceptable off-site borrow. County is responsible for compaction testing.

Question 3. Has the County identified any off-site borrow locations?
Response: No off-site borrow locations have been identified. It is the Contractors responsibility to identify suitable borrow locations.
Question 4. Do the plan quantities include allowances for variances in construction means and methods?

Response: Plan quantities do not include allowances for variances in construction means and methods. It is the Contractors responsibility to address any anticipated allowances in his bid.

Question 5. What type of seeding is to be used for the 6" soil cap on riprap above ordinary highwater?

Response: All project seeding should be Type A as specified on the plans.

Question 6. Can on-site material be used for the riprap soil cap above ordinary highwater?

Response: Yes, on-site material will be allowed for riprap soil cap only. Material will need to be of a consistency that will promote stabilization. No on-site material will be allowed for embankment fill.

Question 7. Can Contractor utilize the on-site jersey barriers supplied by the County?

Response: Contractor may coordinate the use of County supplied on-site jersey barriers. The Contractor is responsible for all traffic control signs and devices to maintain necessary detour as noted on plans.

3. CLARIFICATION OF QUESTION NO. 5 ON ADDENDUM NO. 1 - DATED DECEMBER 4, 2017:

Question 5: Under Notes-Suitable Grade material- “Soil report? What is wrong with excavated material? All sandy except CL.”

Response: Existing soil consists of similar sized particles and not well graded. See note on Plan Sheet 2-N1 regarding Borrow.

All other terms and conditions remain unchanged. Addendum must be acknowledged on the Bid Form.
PERFORMANCE BOND

CONTRACTOR:
(Name, legal status and address)
High Plains Diversified Enterprises, Inc.
P.O. Box 96
Martell, NE 68404

OWNER:
(Name, legal status and address)
Sarpy County, Nebraska
1210 Golden Gate Drive, Suite 1250
Papillion, NE 68046

CONSTRUCTION CONTRACT
Date: January 19, 2018
Amount: $438,262.44

Description:
(Name and location)
Sarpy County Project C-77(15-14), Pflug Road, 228th Street to 230th Street, Culvert Replacement

SURETY:
North American Specialty Insurance Company
1450 American Lane, Suite 1100
Schaumburg, IL 60173

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

This document combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

BOND
Date: February 5, 2018
(Not earlier than Construction Contract Date)
Amount: $438,262.44

Modifications to this Bond: [ ] None [ ] See Section 16

CONTRACTOR AS PRINCIPAL (Corporate Seal)
Company: High Plains Diversified Enterprises, Inc.
Signature: [Signature]
Name and Title: [Mark Smith, President]

SURETY (Corporate Seal)
Company: North American Specialty Insurance Company
Signature: [Signature]
Name and Title: [David A. Dominiani, Attorney-in-Fact]

(Any additional signatures appear on the last page of this Performance Bond.)

FOR INFORMATION ONLY – Name, address and telephone

AGENT or BROKER:
The Harry A. Koch Co.
14010 FNW Parkway, Suite 300
Omaha, NE 68154
402-861-7000

OWNER’S REPRESENTATIVE:
(Architect, Engineer or other party)

This Document conforms to the AIA Document A112TM – 2010
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this bond, except when applicable to participate in a conference as provided in Section 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

   .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

   .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

   .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

   5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

   5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

   5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

   5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

   .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

   .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

This Document conforms to the AIA Document A312™–2010
7. If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted heretofrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
16. Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL  (Corporate Seal)  SURETY  (Corporate Seal)

Company:  

Signature:  
Name and Title:  
Address  

Signature:  
Name and Title:  
Address
PAYMENT BOND

CONTRACTOR:
(Name, legal status and address)
High Plains Diversified Enterprises, Inc.
P.O. Box 96
Martell, NE 68404

OWNER:
(Name, legal status and address)
Sarpy County, Nebraska
1210 Golden Gate Drive, Suite 1250
Papillion, NE 68046

CONSTRUCTION CONTRACT
Date: January 19, 2018
Amount: $438,262.44
Description:
(Name and location)
Sarpy County Project C-77(15-14), Pflug Road, 228th Street to 230th Street, Calvert Replacement

BOND
Date: February 5, 2018
(Not earlier than Construction Contract Date)
Amount: $438,262.44
Modifications to this Bond: ☑ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL  (Corporate Seal)
Company: High Plains Diversified Enterprises, Inc.

SURETY  (Corporate Seal)
Company: North American Specialty Insurance Company

Signature: __________________________
Name __________________________
and Title: _________________________
(Any additional signatures appear on the last page of this Payment Bond)

(for information only – Name, address and telephone)
AGENT or BROKER:
The Harry A. Koch Co
14010 FN B Parkway, Suite 300
Omaha, NE 68154
402-861-7000

OWNER’S REPRESENTATIVE:
(Architect, Engineer or other party)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

This document combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.
1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
   5.1 Claimants, who do not have a direct contract with the Contractor,
       .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
       .2 have sent a Claim to the Surety (at the address described in Section 13).
   5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

6. If a notice of non-payment required by section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

7. When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
   7.2 Pay or arrange for payment of any undisputed amounts.
   7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project is that the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1 Claim. A written statement by the Claimant including at a minimum:

.1 the name of the Claimant;
.2 the name of the person for whom the labor was done, or materials or equipment furnished;
.3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
.4 a brief description of the labor, materials or equipment furnished;
.5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
.6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
.7 the total amount of previous payments received by the Claimant; and
.8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

Signature: ____________________________
Name and Title: _______________________
Address: ____________________________

(Surety)

Company: ________________________________
(Signature: ____________________________)
Name and Title: _________________________
Address: _____________________________

This Document conforms to the AIA Document A312™ – 2010
GENERAL POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS, THAT North American Specialty Insurance Company, a corporation duly organized and existing under laws of the State of New Hampshire, and having its principal office in the City of Overland Park, Kansas and Washington International Insurance Company a corporation organized and existing under the laws of the State of New Hampshire and having its principal office in the City of Overland Park, Kansas, and Westport Insurance Corporation, organized under the laws of the State of Missouri, and having its principal office in the City of Overland Park, Kansas each does hereby make, constitute and appoint:

DAVID A. DOMINIANI, JOAN LEU, MAURA P. KELLY, SHARON K. MURRAY and JACQUELINE L. DREY

JOINTLY OR SEVERALLY

Its true and lawful Attorney(s)-in-Fact, to make, execute, seal and deliver, for and on its behalf and as its act and deed, bonds or other writings obligatory in the nature of a bond on behalf of each of said Companies, as surety, on contracts of suretyship as are or may be required or permitted by law, regulation, contract or otherwise, provided that no bond or undertaking or contract or suretyship executed under this authority shall exceed the amount of:

ONE HUNDRED TWENTY FIVE MILLION ($125,000,000.00) DOLLARS

This Power of Attorney is granted and is signed by facsimile under and by the authority of the following Resolutions adopted by the Boards of Directors of North American Specialty Insurance Company and Washington International Insurance Company at meetings duly called and held on March 24, 2000 and Westport Insurance Corporation by written consent of its Executive Committee dated July 18, 2011.

"RESOLVED, that any two of the President, any Senior Vice President, any Vice President, any Assistant Vice President, the Secretary or any Assistant Secretary be, and each or any of them hereby is authorized to execute a Power of Attorney qualifying the attorney named in the given Power of Attorney to execute on behalf of the Company bonds, undertakings and all contracts of surety, and that each or any of them hereby is authorized to attest to the execution of any such Power of Attorney and to attach therein the seal of the Company; and it is

FURTHER RESOLVED, that the signature of such officers and the seal of the Company may be affixed to any such Power of Attorney or to any certificate relating thereto by facsimile, and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be binding upon the Company when so affixed and in the future with regard to any bond, undertaking or contract of surety to which it is attached."

IN WITNESS WHEREOF, North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation have caused their official seals to be hereunto affixed, and these presents to be signed by their authorized officers this 18th day of January, 2018.

NORTH AMERICAN SPECIALTY INSURANCE COMPANY
WASHINGTON INTERNATIONAL INSURANCE COMPANY
WESTPORT INSURANCE CORPORATION

State of Illinois
County of Cook

On this 18th day of January, 2018 before me, a Notary Public personally appeared Steven P. Anderson, Senior Vice President of Washington International Insurance Company and Senior Vice President of Westport Insurance Corporation and Michael A. Ito, Senior Vice President of North American Specialty Insurance Company and Senior Vice President of Westport Insurance Corporation, personally known to me, who being by me duly sworn, acknowledged that they signed the above Power of Attorney as officers of and acknowledged said instrument to be the voluntary act and deed of their respective companies.

M. Kenny, Notary Public

1, Jeffrey Goldberg, the duly elected Vice President and Assistant Secretary of North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney given by said North American Specialty Insurance Company, Washington International Insurance Company and Westport Insurance Corporation which is still in full force and effect.

IN WITNESS WHEREOF, I have set my hand and affixed the seals of the Companies this 18th day of January, 2018.

Jeffrey Goldberg, Vice President & Assistant Secretary of Washington International Insurance Company & North American Specialty Insurance Company & Vice President & Assistant Secretary of Westport Insurance Corporation
## SIGN-IN SHEET

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>DATE</th>
<th>VENUE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pflug Road – 228th Street to 230th Street</td>
<td>07 December 2017</td>
<td>Project Site</td>
<td>Pre-Bid Meeting</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE</th>
<th>ORGANIZATION</th>
<th>PHONE</th>
<th>E-MAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karl Frederickson</td>
<td>PM</td>
<td>WSP USA</td>
<td>402-323-6575</td>
<td><a href="mailto:Karl.Frederickson@wsp.com">Karl.Frederickson@wsp.com</a></td>
</tr>
<tr>
<td>Michelle Winkelmann</td>
<td>Engineer</td>
<td>WSP USA</td>
<td>402-470-8285</td>
<td><a href="mailto:Michelle.Winkelmann@wsp.com">Michelle.Winkelmann@wsp.com</a></td>
</tr>
<tr>
<td>Kevin MacK</td>
<td>Operations Manager</td>
<td>High Plains Engineering</td>
<td>402-314-0076</td>
<td>kevin.highplainsengineering.com</td>
</tr>
<tr>
<td>Jerey Klaburkec</td>
<td></td>
<td></td>
<td>402-443-8255</td>
<td><a href="mailto:jerey@meccinscontracting.com">jerey@meccinscontracting.com</a></td>
</tr>
<tr>
<td>Joel Schenck</td>
<td></td>
<td>MECC</td>
<td>402-410-4281</td>
<td><a href="mailto:joel@meccinscontracting.com">joel@meccinscontracting.com</a></td>
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<tr>
<td>Chris Wilson</td>
<td>PM</td>
<td></td>
<td>402-331-3169</td>
<td><a href="mailto:chris.w@eaiengineering.com">chris.w@eaiengineering.com</a></td>
</tr>
<tr>
<td>Harley Brown</td>
<td>Foreman</td>
<td>New Vistion</td>
<td>402-225-0070</td>
<td><a href="mailto:harlie@newvistion.com">harlie@newvistion.com</a></td>
</tr>
<tr>
<td>Pat Dowk</td>
<td>Dep. Eng.</td>
<td>GC PM</td>
<td>402-537-6912</td>
<td><a href="mailto:patdowk@99931.com">patdowk@99931.com</a></td>
</tr>
<tr>
<td>Brian Gahar</td>
<td>Supervising Sr.</td>
<td></td>
<td>412-595-4410</td>
<td><a href="mailto:bgahar@99931.com">bgahar@99931.com</a></td>
</tr>
<tr>
<td>Penny Richardson</td>
<td>E.I.T.</td>
<td>New Venture</td>
<td>412-657-8352</td>
<td><a href="mailto:penny.richardson@newventure.com">penny.richardson@newventure.com</a></td>
</tr>
<tr>
<td>Marc Chamberlain</td>
<td>Senior Scientist</td>
<td></td>
<td>412-366-3655</td>
<td><a href="mailto:marc.chamberlain@wra.com">marc.chamberlain@wra.com</a></td>
</tr>
<tr>
<td>NAME</td>
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<td>ORGANIZATION</td>
<td>PHONE</td>
<td>E-MAIL</td>
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<tr>
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</tr>
<tr>
<td>John Gjersvik</td>
<td>PM</td>
<td>VM</td>
<td>402-222-5200</td>
<td><a href="mailto:gjersvik@vw.com">gjersvik@vw.com</a></td>
</tr>
<tr>
<td>Dylan Johnson</td>
<td>Owner</td>
<td>Jackson</td>
<td>402-510-0854</td>
<td></td>
</tr>
<tr>
<td>Sean Niglo</td>
<td>Pres</td>
<td>SNC</td>
<td>402-672-8422</td>
<td><a href="mailto:sean@snccontractors.com">sean@snccontractors.com</a></td>
</tr>
<tr>
<td>Ryan Schaefer</td>
<td>VR</td>
<td>SNC</td>
<td>402-510-1543</td>
<td><a href="mailto:ry@Snccontractors.com">ry@Snccontractors.com</a></td>
</tr>
</tbody>
</table>
MEMO

To: Sarpy County Board of Commissioners

From: Beth Garber

Re: Permission to Bid Pflug Road

On November 14, 2017 I will be requesting permission to solicit bids for Pflug Road, 228th to 230th Street, Project C-77 (15-14). The project includes drainage, structure replacement, earthwork and riprap placement. This has been included in the 2017 FY budget at $500,000; however, the current estimated cost is around $900,000 due to unanticipated roadway failure.

Please contact me with any questions at bgarber@sarpy.com.

November 8, 2017

Beth Garber

cc: Dan Hoins
Scott Bovick
Brian Hanson
Deb Houghtaling
Denny Wilson
SARPY COUNTY PURCHASING DEPARTMENT
BID REQUEST

On November 14, 2017, permission will be requested to solicit bids for Pflug Road – 228th Street to 230 Street, Project C-77 (15-14) for Sarpy County Public Works. The Purchasing Department will ensure that the required legal notices are published, open the bids in the presence of the bidders or their representatives, review the bids, solicit input from any affected department, and make a written recommendation to the County Board.

This purchase has been included as a line item in the current fiscal budget.

YES  XX  NO

It is reasonably expected that the purchase of this item will not cause the department’s total budget to be exceeded.

YES  XX  (Won’t cause over-expenditure)

NO  (May cause over-expenditure)

Budget comments:
Project price is greater than the budget allotment due to the current failure of the roadway and the engineered solution required to address the slope failure.

Justification for Purchase:
Includes drainage, structure replacement, earthwork and riprap placement.

11/8/2017  Denny Wilson
Date  Department Head

11/8/2017  Beth Garber
Date  Purchasing Agent/Purchaser
STATE OF NEBRASKA

County of Sarpy

AFFIDAVIT OF PUBLICATION

Being duly sworn, upon oath, Michael Harrington deposes and says that he is the Accounting Manager or Laura Estep-Bronk deposes and says that she is a Sales Representative or Ron Petak deposes and says that he is the Executive Editor of the Bellevue Leader, Papillion Times, Gretna Breeze and Springfield Monitor, legal newspapers of general circulation in Sarpy County, Nebraska, and published therein; that said newspaper has been established for more than one year last past; that it has a bona-fide paid subscription list of more than three hundred; that to this personal knowledge, the advertisement, a copy of which is hereto attached, was

Wednesday, November 22, 2017
Bellevue Leader
Gretna Breeze
Papillion Times
Springfield Monitor

Thereafter, Wednesday, November 29, 2017
Bellevue Leader
Gretna Breeze
Papillion Times
Springfield Monitor

Thereafter, Wednesday, December 6, 2017
Bellevue Leader
Gretna Breeze
Papillion Times
Springfield Monitor

And that said newspaper is a legal newspaper under the statutes of the State of Nebraska.
The above facts are within my personal knowledge.

Michael Harrington
Accounting Manager

OR

Ron Petak
Executive Editor

OR

Laura Estep-Bronk
Sales Representative

Today's Date: 12/6/2017
Signed in my presence and sworn to before me:

Notary Public

Printer's Fee: $36.04
Customer Number: 210291
Order Number: 0002064408